Queen's University

KINGSTON, CANADA

INCORPORATED BY ROYAL CHARTER IN 1841

CALENDAR
OF
THE FACULTY OF APPLIED SCIENCE

(SCHOOL OF MINING)

FORTIETH SESSION
1932-1933

PRINTED FOR THE UNIVERSITY BY
HANSON & EDGAR
KINGSTON
1932

Special attention is directed to the following:

Regulations concerning supplemental and mid-session examinations.

Changes in Timetables.

New regulations for M.Sc.

Increase in Fees.

Vaccination Certificates.

Queen's University

KINGSTON, CANADA

INCORPORATED BY ROYAL CHARTER IN 1841

CALENDAR

OF

THE FACULTY OF APPLIED SCIENCE

(SCHOOL OF MINING)

FORTIETH SESSION

1932-1933

1931/32

CALENDAR

1932

JANUARY

S	M	T	W	T	F	S
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FEBRUARY

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1933

JANUARY

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FEBRUARY

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MARCH

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JUNE

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AUGUST

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OCTOBER

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NOVEMBER

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DECEMBER

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ACADEMIC YEAR

1932

July 15 Friday—Last day for applying for September examinations at the University or outside centres; or for exemption from these examinations or for degree.

Aug. 31 Wednesday—Shop Work for Courses F. and G. begins.

Sept. 1 Thursday—Supplemental Pass Examinations begin.

*Sept. 27 Tuesday—Registration of First Year Students. Late fee after this date. ($3 on Wednesday and $1 more for each day after that date).

Sept. 28 Wednesday—Classes of First Year open at 8 a.m.

Sept. 28 Wednesday—Registration of Second, Third and Fourth Years Late fee after this date, ($3 on Thursday and $1 more for each day after that date.)

Sept. 29 Thursday—Classes of Second, Third and Fourth Years open at 8 a.m.

Oct. 5 Wednesday—Last day of registration (with extra fee) of students in Applied Science who have not previously obtained from the Faculty permission to register later.

Dec. 15 Thursday—Mid-year examinations begin.

Dec. 22 Thursday—Christmas holidays begin at 5 p.m.

1933

Jan. 6 Friday—Classes re-open (2nd term) at 8 a.m.

Mar. 15 Wednesday—Last day for receiving applications and fees for graduation.

Apr. 1 Saturday—Last day for receiving manuscripts and essays for prizes.

Apr. 7 Friday—Classes close at 5 p.m.

Apr. 11 Tuesday—Examinations begin.

Apr. 14 Good Friday.

May 10 Wednesday—Convocation for distributing prizes, announcing honours and conferring degrees.

*Any student entering the Faculty of Science for the first time must submit a certificate showing successful vaccination.

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Alice King.

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E. C. Kyte

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Retire 1932

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Dennis Jordan, B.A., M.D., C.M.[6] ..... Toronto

Retire 1933

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J. G. Dwyer, M.D., LL.D.[6] ..... New York
Senator H. H. Horsey, B.A.[1] ..... Ottawa
D. H. Laird, M.A., K.C.[1] ..... Winnipeg
Judge Lavell, B.A.[3] ..... Kingston
J. M. Macdonnell, M.A.[7] ..... Toronto
R. O. Sweezey, B.Sc.[3] ..... Montreal

Retire 1934

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J. C. Connell, M.A., M.D.[6] ..... Kingston
J. M. Farrell, B.A., K.C.[3] ..... Kingston
Alexander Longwell, B.A., B.Sc.[1] ..... Toronto
W. L. Grant, M.A., LL.D.[2] ..... Toronto
Senator Andrew Haydon, M.A., LL.B.[6] ..... Ottawa
E. R. Peacock, M.A.[6] ..... London, Eng.
Charlotte E. Whitton, M.A.[3] ..... Ottawa

Retire 1935

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J. M. Campbell, Esq.[7] ..... Kingston

Retire 1936

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1Elected by the University Council for three years.
2Elected by the Benefactors for four years.
3Elected by the Graduates for three years.
4Elected by the Board of Trustees to represent the Faculty of Applied Science for three years.
5Elected by the Board of Queen's Theological College for one year.
6Elected by the Board of Trustees for four years.
7Elected by Benefactors to represent the Faculty of Applied Science for three years.

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Ex-officio Members

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The Principal

The Members of the Board of Trustees

The Members of the Senate

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Retire 1932

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Retire 1933.

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*W. F. Nickle, B.A., K.C. ..... Kingston
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Retire 1934

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Jas. Wallace, M.A., M.D. ..... New York

Retire 1935

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G. C. Monture, B.Sc. ..... Ottawa
E. C. Watson, M.A., M.D. ..... Detroit

*Elected by the Council as their representatives on the Board of Trustees.

Retire 1936

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Marion Redden, B.A. ..... Kingston
Gordon Smith, B.A., B.Sc. ..... Kingston

Retire 1937

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Retire 1938

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A. L. Clark, B.Sc., Ph.D. ..... Dean of the Faculty of Applied Science
Frederick Etherington, M.D. ..... Dean of the Faculty of Medicine
Rev. H. A. Kent, M.A., D.D. ..... Principal of Queen's Theological College

Elective Members

The Faculty of Arts.

J. A. McRae, M.A., Ph.D. ..... Retires 1933
P. G. C. Campbell, M.A. ..... Retires 1934
Norman Miller, M.A., Ph.D. ..... Retires 1935

The Faculty of Applied Science

D. M. Jemmett, M.A., B.Sc. ..... Retires 1933
A. Jackson, *B.Sc.* ..... Retires 1934
W. P. Wilgar, B.Sc. ..... Retires 1935

The Faculty of Medicine

Dr. Austin ..... Retires 1933
Dr. Gibson ..... Retires 1933
Dr. D. C. Matheson ..... Retires 1933

Queen's Theological College.

Dr. J. R. Watts ..... Retires 1934

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Ottawa

W. L. Goodwin, B.Sc., D.Sc., F.R.S.C.
Emeritus Professor of Chemistry.
Montreal

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50 Clergy Street

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Professor of Geology,
120 University Avenue

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51 Queen's Crescent.

W. P. Wilgar, B.Sc.
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1 Mack Street

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311 King Street West

G. J. MacKay, B.Sc.
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868 Princess St.

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11 Kensington Avenue

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Queen's University

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26 Wellington Street

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226 Frontenac Street

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208 Albert Street

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80 College Street

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Associate Professor of Chemistry,
Queen's Crescent

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295 Alfred Street

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213 Queen Street

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Assistant Professor of Chemistry,
Annandale Apartments, Sydenham Street.

S. C. MORGAN, M.Sc., M.S.,
Assistant Professor in Electrical Engineering,
220 Frontenac St.

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Assistant Professor of Chemistry,
148 University Ave.

R. L. DORRANCE,, B.A.,
Assistant Professor in Chemistry,
233 Johnston Street

O. A. CARSON, B.Sc., A.M., Ph.D.
Assistant Professor in Metallurgy,
278 Frontenac Street.

O. L. BOCKSTAHLER, M.A.,
Assistant Professor of German,
172 Barrie St.

M. IRVINE, M.A.,
Lecturer in English, French and German,
Queen's University

E. E. DUTHIE, M.A.,
Lecturer in English,
Queen's University

MME MCCONNELL, Brevet Supérieur, C.A.P.,
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31 Ellerbeck St.

H. STEWART, B.Sc.,
Lecturer in Electrical and Mechanical Engineering,
Queen's University

J. O. WATTS, M.A.,
Lecturer in Mathematics,
Queen's University.

B. W. Sargent, M.A.,
Lecturer in Physics, Queen's University.

E. E. Watson, M.Sc.,
Lecturer in Physics,
313 Brock Street

H. M. Cave, M.A., Ph.D.,
Lecturer in Physics, Queen's University.

R. W. Stevens, B.Sc.,
Lecturer in Mathematics and Draughting, Queen's University.

Geo. L. Edgett, M.A.,
Lecturer in Mathematics, Queen's University.

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Instructor in Shop Work: A. C. Baiden. *N*
Instructor in Blacksmithing: W. E. Connolly.
Instructor in Chemistry: M. C. McNab, M.A.

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Chemistry: S. A. McNeight, Fellow; F. S. Wilder, A. C. Plewes, P. E. Moss.
Mineralogy: C. S. Longley, B.A., N. D. Runnells, D. K. Burke.
Mining and Metallurgy: A. Lang.
Chemical Engineering: Stuart McVeigh, B.Sc.
Electrical Engineering: W. C. Little.
Mechanical Engineering: G. W. Jarvis, B.Sc., Jas. Campbell.
Drafting: D. A. Jack, B.Sc.
Surveying: A. G. Farquharson, B.Sc.
Geology—D. K. Burke.

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The Professors of Biology and Geology

The Observatory Board

The Principal and the Professor of Astronomy

Superintendent of Buildings

James Bews

Secretary-Treasurer Athletic Board of Control

C. C. Hicks

Secretary-Treasurer General Alumni Association
Manager of Employment Bureau

G. J. Smith

GOVERNMENT AND ADMINISTRATION

The administration of the University is vested in the Board of Trustees, the University Council, the Senate, and the Faculty Boards.

THE BOARD OF TRUSTEES

The Board of Trustees consists of *ex-officio* and elective members. The former are the Chancellor, the Principal and the Rector. The latter consists of (1) one representative from each affiliated college, (2) representatives as provided for by the Statutes from (*a*) the University Council, (*b*) the Benefactors, (*c*) the Graduates, and (3) members elected by the Board of Trustees.

The functions of the Board of Trustees are to manage the finances, to possess and care for the property, to procure legislation, to appoint instructors and other officers, and in general to attend to such external matters as do not relate directly to instruction.

THE UNIVERSITY COUNCIL

The University Council consists of the Chancellor, the Trustees, the members of the Senate, and an equal number of members—graduates or alumni—elected by the graduates.

The Chancellor is elected by the Council, except when two or more candidates are nominated, in which case the election is by registered graduates and alumni. He holds office for three years; and, as the highest officer of the University, presides at meetings of the Council, at Convocation and at statutory meetings of the Senate. In his absence he is represented by the Vice-Chancellor.

The Functions of the Council are:

(1) To elect six trustees, two of whom shall retire annually.

(2) To make by-laws governing the election of (*a*) the Rector by the registered students, (*b*) seven trustees by the benefactors, (*c*) six trustees by the University Council, and (*d*) six trustees by the graduates.

(3) To discuss all questions relating to the University and its welfare.

(4) To make representation of its views to the Senate or the Board of Trustees.

(5) To decide on proposals for affiliation.

(6) To arrange all matters pertaining to (*a*) its own meetings and business, (*b*) the meetings and proceedings of Convocation, (*c*) the installation of the Chancellor, and (*d*) the fees for membership, registration, and voting.

The annual meeting of the Council is held on the Tuesday immediately preceding Convocation.

THE SENATE

Until 1913 the Senate was composed of all the Professors, Associate Professors, and Assistant Professors on the staff of the University. It transacted all business relating to the work of instruction, the arrangement of classes, the conduct of examinations, and the award of standing, having charge in general of the internal administration of the University.

In 1913, however, Faculty Boards were created to relieve the Senate of much work which, owing to the growth of the University, had increasingly devolved upon it, and at the same time the Senate was made a representative body composed of certain members of the various Faculties.

The Senate now consists of:

The Principal.
The Vice-Principal.
The Principal of Queen's Theological College.
The Dean of the Faculty of Arts.
The Dean of the Faculty of Applied Science.
Three Professors elected by the Faculty of Arts.
Two Professors elected by the Faculty of Queen's Theological College.
Three Professors elected by the Faculty of Medicine.
Three Professors elected by the Faculty of Applied Science.

The Functions of the Senate are:

(1) To determine all matters of an academic character which concern the University as a whole.

(2) To consider and determine all courses of study leading to a degree, including conditions of Matriculation, on recommendation of the respective Faculty Boards; but the Senate shall not embody any changes without having previously presented these to the Faculty.

(3) To recommend to the Board of Trustees the establishment of any additional Faculty, Department, Chair, or Course of Instruction in the University.

(4) To be the medium of communication between the Alma Mater Society and the Governing Bodies.

(5) To determine all regulations regarding the social functions of the students within the University, and regarding the University Library and University Reading Rooms.

(6) To publish the University Calendar.

(7) To conduct examinations.

(8) To grant Degrees.

(9) To award University Scholarships, Medals and Prizes.

(10) To enforce the Statutes, Rules and Ordinances of the University.

(11) And generally, to make such recommendations to the Governing Boards as may be deemed expedient for promoting the interests of the University.

THE FACULTY BOARDS

The Faculty Boards are constituted as follows:

For the Faculty of Arts and for the Faculty of Applied Science, the Dean, Professors, Associate Professors, Assistant Professors, and Lecturers of each Faculty have power to meet as separate boards, and to administer the affairs of each Faculty under such regulations as the Board of Trustees may prescribe.

For the Faculty of Medicine, the Dean, Professors, Associate Professors, and Assistant Professors have power to meet as a separate board, and to administer the affairs of the Faculty under such regulations as the Board of Trustees may prescribe

The principal and vice-principal are *ex-officio* members of each of the foregoing Faculty Boards.

The Functions of the Faculty Boards are:

(1) To recommend to the Senate courses of study leading to a degree, and the conditions of admission.

(2) To decide upon applications for admission or for change of course, subject to the regulations of the Senate.

(3) To submit to the Senate names for both ordinary and honorary degrees.

(4) To arrange the time-table for classes and to edit the Faculty Calendar, subject to the approval of the Senate.

(5) To control registration, and determine the amount of fees and manner of payment, subject to the regulations of the Senate and the approval of the Board of Trustees.

(6) To deal with class failures.

(7) To exercise academic supervision over students.

(8) To make such recommendations to the Senate as may be deemed expedient for promoting the efficiency of the University.

(9) To award Faculty Scholarships. Medals and Prizes.

(10) To appoint, within the limits of the funds made available by the Trustees, such sessional assistants, fellows, tutors and demonstrators as shall be needed to give instruction in the subjects taught by the Faculty.

(11) To pass such regulations and by-laws as may be necessary for the exercise of the functions of the Faculty.

THE CANADIAN OFFICERS TRAINING CORPS

The Queen's Contingent of the C.O.T.C., formed at the outbreak of the Great War under Lieut.-Col. A. B. Cunningham, was organized as a unit of the Militia in February 1915. Re-organized after the War by Col. A. Macphail, C.M.G., D.S.O., it is now commanded by Lieut.-Col. P. G. C. Campbell, and consists of three companies: "A" Coy. (Arts), "B" Coy. (Medicine), and "C" Coy. (Science).

The training after the recruit year prepares for examination in "A" and "B" Certificates in Infantry, Engineering and Medical Services, qualifying, the

former for the rank of Lieutenant, the latter for that of Captain in the N.P.A.M. Commissions in the Permanent Force are offered from time to time to qualified members of the C.O.T.C. For commission in the Royal Canadian Air Force and the Royal Canadian Signal Corps only graduates in Applied Science are eligible. Students who enrol in their first year, complete the year's training, and are returned as fully efficient, are excused from Physical Training.

HISTORICAL NOTE.

The School of Mining, now the Faculty of Applied Science, Queen's University, was founded in 1893 under an Ontario Charter which placed its management in the hands of a Board of Governors elected by its shareholders, i.e., the subscribers to its funds. While originally a Mining School it has been expanded to include courses of study for degrees in mining and metallurgy, in civil, mechanical, electrical and chemical engineering, in analytical chemistry and assaying, and in geology and mineralogy. The objects of the institution were to provide thorough instruction both theoretical and practical, in the above and other branches of applied science, and to adapt courses of study and methods of presentation to the conditions prevailing in Canada, so as to secure as nearly as may be a maximum usefulness to the country.

For several sessions all its Departments were housed in Carruthers Science Hall, which had been erected in 1889, but in view of the rapid success and increased requirements of the School, the Provincial Legislature in 1900 provided for its accommodation two large buildings, Ontario Hall for the Departments of Mineralogy, Geology and Physics, and Fleming Hall for the Departments of Civil, Mechanical and Electrical Engineering. More recently the Provincial Government erected Gordon Hall, which is entirely devoted to Chemistry; and, through the generosity of Professor Nicol and other graduates, Nicol Hall has been built for the accommodation of the class rooms and laboratories of the Department of Mining and Metallurgy. These changes permitted the Civil Engineering Department to move into Carruthers Hall, leaving room in Fleming Hall for the already overcrowded departments of Electrical and Mechanical Engineering. Miller Hall, one of the finest buildings on the campus was opened in 1931 for the departments of Mineralogy and Geology.

From its inception the School of Mining was closely connected with the University. The students of the School of Mining received their degrees from the University and the graduates in Science enjoyed the same rank and privilege as other graduates in representation upon the University Council and in the election of University Trustees. The staff of the School of Mining constituted practically the Science Faculty of the

University, some of its members being actively connected also with the Arts and Medical Faculties, and the Faculty being represented with other faculties on the Senate of the University.

The School of Mining was formerly under the control of a separate board of Governors, but in the year 1916 it became the Faculty of Applied Science of Queen's University.

Kingston is well situated as the seat of a college of engineering and applied science. Geology and mineralogy, two of the fundamental subjects of a mining engineer's education and also important in other scientific professions, are studied to best advantage where the minerals can be seen as they lie in nature, and where geological formations can be examined *in situ*. In a few hours a class of students can be taken to a region so rich in mineral species that about forty different kinds have been secured in an afternoon. There are several geological formations out-cropping within easy walking distance of the city. If to this be added the accessibility by a short railway journey of mines in operation, it will be seen the opportunities for instructive demonstrations to classes in mineralogy, geology and mining are very numerous. The metallurgical works at Deloro, eighty miles from Kingston, are also open to our students. It is thus possible to give to the study of mineralogy, geology, mining and metallurgy, that practical turn which not only adds interest to the college course, but shortens the period between graduation and attainment of proficiency and confidence in professional work.

The variety of topographical features in the surrounding country affords the best of material for practice in all branches of surveying, including railway, topographic, hydrographic and land surveying. The main line of the Canadian National passes through Kingston, which is also a terminus of branches of the Canadian Pacific and Canadian Northern Railways. The Canadian Locomotive Works, which are the largest locomotive shops in Ontario, are within ten minutes' walk of the University, and are open to students for study and for assisting in engine testing and similar work. Kingston has a large Dry Dock, in whose yards steel construction can be practically studied. The locks of the Rideau Canal can be visited at Kingston Mills, six miles from the heart of the city. There are also several water powers within easy distance. Students of civil, mechanical and electrical engineering thus have easy access to practical illustrations of their professional studies.

REQUIREMENTS FOR ADMISSION.

Candidates desiring to enter the Faculty of Applied Science should under no circumstances come to the University without having first submitted their certificates to the Registrar for a statement regarding their value. Certificates should be in the Registrar's hands by September 1.

I.—ADMISSION BY MATRICULATION.

A candidate for admission into the Faculty of Applied Science must present certificates giving him credit in the following subjects of Pass and Honour Matriculation:

Part I. Pass Matriculation in the following subjects: *English, History (Canadian and Ancient) or Canadian History and Music, Mathematics, (Algebra and Geometry), Experimental Science (Physics and Chemistry) or Agriculture (Parts I and II), and any two of Latin, Greek, French, German, Spanish, Italian, or Arithmetic.* Arithmetic to be offered by candidates from technical schools only.

Part II. Honour Matriculation in the following subjects: *English, Mathematics (Algebra, Geometry and Trigonometry), and one of Experimental Science (Physics and Chemistry), Latin, Greek, French, German, Spanish or Italian.*

Note:— Honour Matriculation in History, or in Biology, or in a Foreign Language, not offered under Part II may be submitted for one of the languages of Part I.

Candidates specially qualified for an Engineering Course may be admitted at the discretion of the Faculty, on conditions to be determined in each case, even though they do not present precisely the subjects named above. This provision applies to graduates of Technical Schools who have passed the regular matriculation examinations in the subjects taught in their schools, and to candidates with practical engineering experience.

Candidates under twenty-one years of age who have credit in all the subjects of Part I and candidates over twenty-one years of age with incomplete matriculation may be admitted to a preliminary year in the Faculty of Arts for the purpose of satisfying the Science admission requirements. This preliminary year will ordinarily include English 1, Mathematics 1, Physics 1, a foreign language, and either Biology or another foreign language.

Candidates entitled to enter the Faculty of Arts may satisfy the requirements of Part II by extra-mural and Summer School work.

II.—ADMISSION BY EQUIVALENT EXAMINATION.

The following certificates are accepted for Pass Matriculation, (Part I), in the subjects which they cover.

Alberta	Third Year High School.
British Columbia	Grade XI with Science of Grade XII.
Manitoba	Grade XI Engineering Matriculation.
New Brunswick	Class I.
Nova Scotia	Grade XI.
Prince Edward Island	First Class Teachers' License or Second Year Certificates from Prince of Wales College.
Saskatchewan	Second Class (Third Year High School)
Quebec	University School Leaving Certificate. Grade XI Diploma.

Any one of the following certificates will be accepted in place of Honour Matriculation in the same subjects if the required standing has been made in the subjects covered.

Alberta	Fourth Year High School.
British Columbia	Grade XII.
Manitoba	First Class.
New Brunswick	Grammar School.
Newfoundland	Associate Grade.
Nova Scotia	Grade XII.
Ontario	Upper School.
Prince Edward Island	Honour Diploma of Third Year, Prince of Wales College.
Saskatchewan	First Class. (Fourth Year High School).

NOTE.—A certificate from any school which is on the list of schools approved by any University or Technical College of recognized standing in the United States will be accepted as equivalent to matriculation examination *pro tanto*.

III.—ADMISSION TO ADVANCED STANDING.

A student who has already taken, in a University Arts or Science Faculty or in a recognized technical or military school, subjects included in a course in the Faculty of Applied Science will, on entering upon a course for the degree of B.Sc., be admitted to the year for which he is qualified.

A candidate for advanced standing must submit with his application a Calendar of the institution in which he has studied together with an official statement of the subjects passed and the standing made.

IV.—ADMISSION OF SPECIAL STUDENTS.

Students not proceeding to a degree may take any classes for which they are prepared. The work in all classes is so arranged that those who wish to study, either for scientific interest or for the improvement of their qualifications for any particular position, may profitably pursue their studies in the Faculty of Applied Science.

The Faculty will admit under this paragraph, as special students, only such candidates as are fitted to take part of the classes of a course. It will not admit as special students those whom, on account of previous poor records, it is no longer desirable to continue as regular students.

Prospective students under this section should correspond with the Dean of the Faculty of Applied Science in regard to the arrangement of such a course.

MEDAL.

The Governor-General's medal is awarded each year to the student of the graduating class making the highest standing in the third and fourth years. A candidate to be eligible must write on all the examinations of the fourth year.

FELLOWSHIPS

1. Applications for Fellowships will be received by the Registrar up to May 1st. If no appointment is made by that date further applications will be received up to September 1st.

2. Fellows shall be selected and the character of their work shall be determined by the Department concerned in consultation with the Dean. The University reserves the right to dismiss a Fellow whose work is not satisfactory.

3. A student appointed to a Fellowship shall carry on research work for the whole session and embody the results in a thesis. The research may

take the form either of independent investigation or of assistance in an investigation carried on by some department. The Fellow may be required to undertake tutorial work not to exceed six hours a week.

4. The income of the Fellowship will be paid in five instalments, of which the last will be paid only after the thesis has been accepted. A candidate for degree at the May Convocation must submit his thesis by April 30. Except by special permission, other Fellows must submit their theses not later than September 20.

The Milton Hersey Fellowship in Chemistry.

This Fellowship of the annual value of $500, has been endowed by Milton L. Hersey, M.Sc., LL.D., of Montreal. It is open to graduates of all universities and technical colleges.

SCHOLARSHIPS AND PRIZES

Exhibition of 1851 Science Research Scholarship.

This scholarship, of the annual value of £250 stg., is awarded by Her Majesty's Commissioners for the Exhibition of 1851 to students who have given evidence of capacity for original research, and are under 26 years of age. A given number of scholarships are awarded annually to students in Canada recommended by the Universities approved by the Commissioners.

The nominee must be a British subject, must have been a bona fide student of science for three years, must have been a student of the University for a full year immediately before his nomination, must be a student of the University at the time of his nomination, and must pledge himself not to hold any position of emolument whilst holding the scholarship without special permission from the commissioners. He is recommended to the commissioners by the Senate of the University. The scholarship will be tenable ordinarily for two years and in cases of exceptional merit for three years. The scholar will, in the absence of special circumstances, be required to proceed to a country other than that in which he received his scientific training, and there pursue some investigation likely to promote technical industries or scientific culture. The particular investigation the student proposes to pursue must be stated before a scholarship can be awarded.

Students of the Faculty of Applied Science are eligible for this scholarship.

The 1851 Science Research Scholars from Queen's University are the following:—

Norman R. Carmichael, M.A., 1893-4.
Thomas L. Walker, M.A., 1895-6.
Frederick J. Pope, M.A., 1897-8.
Wm. C. Baker, M.A., 1900-1.
C. W. Dickson, M.A., 1901-2-3.
C. W. Knight, B.Sc., 1904-5.
F. H. MacDougall, M.A., B.Sc., 1905-6.
C. Laidlaw, B.A., M.D.,, 1907-8.
N. L. Bowen, M.A., B.Sc., 1909-10.
Walter A. Bell, B.Sc., 1911-12.
J. R. Tuttle, M.A., 1913-14.
R. C. Cantelo, M.Sc., 1915-16.
D. G. H. Wright, B.Sc., 1921.
R. H. F. Manske, M.Sc. 1924.
Donald C. Rose, M.Sc., 1924.
H. M. Cave, M.A., 1926.
B. W. Sargent, M.A., 1928.

Scholarships are tenable in the session following their award. By special permission of Faculty, the recipient of a Scholarship, available in the third and fourth years of his course, may postpone the use of the Scholarships for one year in order to engage in practical work connected with his chosen profession.

The Kenneth B. Carruthers Scholarships in Mining and Metallurgy—Value $137.50 Each.

Given in memory of Major Kenneth B. Carruthers, B.Sc., who was killed at Passchendale in October, 1917. Two scholarships are awarded annually on the results of third year work, one to the student in Mining and Metallurgical Engineering (Course A) and the other to the student in Chemical and Metallurgical Engineering, Metallurgical option, (Course D) making the highest standing in the whole year's work.

The P. D. Ross Scholarships.

Two scholarships of the value of $100 and $50 respectively. These scholarships are awarded annually to the students obtaining highest and second highest standing in the subjects common to the courses of the second year.

Robert Bruce Scholarships.

Under provisions of the will of the late Robert Bruce of Quebec the University has established a Scholarship worth about $75 in each of the Faculties of Arts, Applied Science, and Medicine. Until 1948 the award is limited to students of Scottish extraction.

The Scholarship in each Faculty will be awarded at the end of the first year to the student who has made the highest standing on the regular examinations of that year. One third of the value of each Scholarship will be paid to the winner in each of the second, third, and fourth years of his Course provided that he is in attendance in the Faculty in which the award was made.

The Sir Sandford Fleming Practical Science Scholarship.—Value $70.

Given by the late Chancellor of the University, Sir Sandford Fleming, C.E., K.C.M.G., LL.D. Awarded to the student of the Faculty of Applied Science obtaining the highest average on the examinations at the end of the first year.

The N. F. Dupuis Scholarship.—Value $60.

This scholarship has been founded by the graduates as a mark of their appreciation of the long and effective services of Dr. N. F. Dupuis, as Dean of the Faculty and Professor of Mathematics. The scholarship is of the value of $60, and is awarded to the student who makes the highest marks in Mathematics of first year at the April Examinations.

Dr. W. H. Nichols Scholarships in Chemistry.

Two scholarships of a value of $60 and $40 respectively will be awarded to the students obtaining the highest mark during the year in Qualitative Analysis, Chemistry 2 (Arts) and Qualitative Analysis II (Applied Science).

The A. E. Segsworth Prize.—Value $50.

This is a prize founded by R. F. Segsworth, Esq., Toronto, in memory of his brother, A. E. Segsworth, B.A., Ph.D. The prize is awarded to the student of any year who hands in before December 1st the best account of his previous summer's experience in practical underground mining.

The Dr. William Moffat Scholarship.—Value $50.

This scholarship has been founded by Dr. William Moffat, of Utica, and is awarded annually to the student making the highest standing in first year chemistry. The award will be made on combined results of class work and examination and students in both Arts and Science will be eligible.

The L. M. Arkley Prize—Value $50.00.

This is a prize founded by the Scots Run Fuel Corporation of Morgantown, W. Va., in recognition of Professor Arkley's interest in the proper methods of purchasing, analyzing and burning of coal. To be awarded to the fourth year student in Mechanical Engineering who gives evidence that he understands the sampling and analyzing of coal and submits, before April 1st of each year, the best paper on the phase of the subject assigned.

The E. T. Sterne Prize in Chemical Engineering—Value $25.00

To be awarded a student in Chemical Engineering at the end of his third year, for the best essay describing his summer work. Essays to be handed in by October 31st. The donor desires that emphasis be laid on a discussion of the theoretical principles in Chemistry and Physics underlying any one of the manufacturing processes described.

Prize of Society of Chemical Industry—Value $25.00

The Society of Chemical Industry offers an annual prize of $25 to be awarded to the undergraduate student in any branch of chemistry who presents a paper on his summer's work, or on any other chemical subject which he may select. This paper may be a thesis or paper required in his regular work of the year. The work or subject treated must relate to some branch of chemistry. Essays must be submitted not later than February 28th to the Secretary of the Ottawa Section of the Society of Chemical Industry. The successful competitor will be called upon to read his winning essay at a regular meeting of the Ottawa Section of the Society.

Engineering Institute of Canada Prize—Value $25.00.

Awarded by the Engineering Institute of Canada to the student in any department of engineering, who, in the year prior to his graduating year, has proved himself most deserving, as disclosed by the examination results of the year in combination with his activities in the students' engineering organization, or with a local branch of a recognized engineering society.

Prizes of The Canadian Institute of Mining and Metallurgy.

Premiums and prizes at the discretion of the Council, may be given annually for papers read by student-members of the Institute and affiliated students during the year. Any such award shall be made by the Council within three months after the Annual Meeting.

Engineering Society Prizes.

The Engineering Society of Queen's University offers two prizes of $15.00 and $10.00 for the two best papers on scientific subjects, by members

of the society. These papers must be read before the society, and five papers, at least, must be presented before the prizes will be awarded. These prizes are open for competition to all students of Engineering.

The Douglas Tutorships.

At the beginning of session 1910-11 a gift from Dr. James Douglas, of New York, led to the establishment of a system by which first year students were tutored by men selected from the senior years. The instruction is given out of class hours and as each tutor gives his whole attention to not more than five students in a period, the result is that of individual teaching.

REGULATIONS

N.B.—Students taking a regular course are subject to all rules and Regulations immediately upon publication, unless otherwise specified.

1. The Faculty may at any time, either during the term, or after the close of the term, require any student to withdraw from the University whose conduct, attendance, work or progress is deemed unsatisfactory.

2. Registration.—Students of first year must register and pay fees on the day before the opening of session. Students of other years will register and pay fees on the first day of session. A student who fails to register at the prescribed time must pay an additional fee of $3.00 on the first day thereafter, with $1.00 for each day after that date, unless specially granted exemption by Faculty. No student proceeding to a degree will be allowed to register after the seventh day of the session except by special permission of the Faculty, *which permission must be obtained before the opening of session.*

Any student entering Facuty of Science for the first time must submit a certificate showing successful vaccination.

3. Attendance.—Students are required to attend seven-eighths of class lectures before permission will be given to write on examinations, and seven-eighths of laboratory hours before laboratory work will be certified. Exemption from this rule can be obtained only on application to the Faculty. All absences for whatever cause, including illness or late registration, must not exceed one-eighth of the total number of hours of work in any subject.

4. Courses.—All students must take the subjects required in their courses in conformity with the calendars of their years of attendance. If a student wishes to change his course he must first obtain the permission of the Faculty.

5. Sessional Examinations.—Sessional examinations are held in all the subjects prescribed in the various courses. Fifty per cent. is required in each subject for pass standing. In determining a student's standing at a sessional examination, professors are empowered to take into account his entire class record.

Regular students must take the April examinations in all subjects in which they are registered and in which such examinations are held. Failure in more than four classes, including practical classes in which no written examinations are held, involves the loss of the session. A student failing in not more than four classes is given supplemental examinations in the following September, a mark of 55% being required on each examination. If he fails in more than one of these classes he may not proceed to the next higher year but must repeat a year's work, the time-table for which will be drawn up by a committee. If a student repeating the work of any year fails in classes enough to involve the loss of the year he must withdraw.

A student shall not enter the third year until he has passed all the examinations of the first year; nor the fourth year until he has passed all the examinations of the second year. Engineering Field Work I. is regarded as a second year class and comes under this regulation both in respect to back classes and to admission to the fourth year. A student who is debarred from entering the third year because of back classes in the first year, or from entering the fourth year because of back classes in the second year, shall not be allowed to write on subsequent examinations in these classes without special permission from Faculty.

6. Repeaters.—No student may repeat more than one year of his course except by special permission of the Faculty.

7. Mid-Term Examinations.—Examinations are held for all first year students about the middle of the Autumn term in the regular class hours.

Mid-Session Examinations.—Two hour examinations are held for first and second year students in all subjects the week before Christmas vacation. A student repeating his first year who fails in four or more of these examinations will be required to withdraw from the University. A student repeating his second year who fails in more than four subjects will be required to withdraw. A proper refund on fees paid will be made. The attention of all students is called to Regulation No. 1.

Examinations will be held in December in all classes of the third and fourth years which are not offered in the second term.

The Mid-year examination in all subjects in which the instruction terminates at that time are final examinations, and no other papers will be set in these subjects until the following September.

Supplemental Examinations.—Unless specially excused by the Faculty, upon application received at the Registrar's office before July 15, all students who fail in one or more subjects of their year up to a total of four must write supplemental examinations in all such subjects in September of the same year as a condition of admission to the next higher year of their course.

Penalty For Failure To Write.—If a student fails to write an examination from which he has not been excused by the Faculty a penalty of $10 is charged. The student must pay in addition the regular supplemental examination fee of $10.00.

A student who has not been registered in the session in which he wishes to write on any supplemental examinations must pay the registration fee of $10 in addition to the examination fee.

Students may write on September examinations at approved outside centres but application must be made by July 15th to the Registrar.

8. Practical Work.—Students are required to take the practical courses given in the calendar unless they have followed similar courses in other educational institutions, but instructors may, at their discretion, modify the work in the case of students who have had experience in the field, in engineering works, etc. Such students may be set immediately at more advanced work than that required of those who have not had such experience.

9. Excursions.—The excursions are compulsory for all fourth year students in courses A. D. E. F. and G., and third year students in course B.

10. Vacation Work.—Before applying for a degree a candidate is required to submit certificates of having had at least six months' employment of a nature that in the opinion of the departments concerned shall have given him suitable experience in the practice of his profession.

11. Graduation.—Applications for degree must be made before March 15 on forms supplied by the Registrar.

12. Graduation with Honours.—Honour standing will be given to any student who graduates with an average of seventy-five per cent. or upwards upon the whole of the fourth year work in his course. Credit for Honour standing will be given on the diploma and in the list of graduates a mark of distinction will be placed with the names of those graduating with Honour standing.

The following percentages are required for standing in all courses:

Division I.—.....75% and over
Division II.—..... 62 - 74%
Division III.—..... 50 - 61%

13. Student Self-Government—All students are members of the Alma Mater Society, the chief instrument of student government, and are expected to share in its duties and responsibilities.

FEES

Students will pay upon registration the Tuition Fees indicated below. A student may not attend classes until he has paid at least the first instalment of his fees, nor enter upon the work of the second term until he has paid his fees in full.

Sessional Fees (including registration, tuition, examination, library, laboratory, health insurance and student interests. The fee for athletics, which is part of student interests, gives admission to all home games except play-offs) :—

If paid on registration	$200 00
If paid in instalments:	
1st payment on registration	$120 00
2nd payment, on or before Jan. 6	85 00

Fifth Year in Commerce.

If paid in full on registration	$120 00

This includes all sessional fees.

(This year is taken in the Faculty of Arts under regulations of that Faculty.)

Deposits.—For covering expenses of breakages, etc., a first year student must deposit $5 with the Treasurer. If at any time the amount of breakages, etc., exceeds $3, an additional deposit of $5 must be made.

For second, third and fourth years the deposit is $5 except in the following courses :—

Second Year Courses A, B, C, D,	$10 00
Third Year Courses A, and Dm.	10 00
Third Year Courses B and Dc.	15 00
Fourth Year Course B.	15 00

Charges will be made for the use of platinum, and specially expensive chemicals and apparatus. All money to the credit of the depositors will be returned at the end of the session on presentation of the deposit receipt properly certified.

The fees below are payable as they are incurred.

Special Charges.

Pro tanto allowance of courses	$10 00
Late registration. See Regulation 1	3 00
Supplemental Examination, one subject	10 00
Each additional subject	2 00
Writing at outside centre in April (if permitted)	5 00
Late application for supplemental examination or graduation	3 00

Fees for Single Classes.

Registration	10 00
Examination	10 00
Student Interests	22 75
Any course of lectures	20 00
Drawing, One Course, per Session	20 00
Surveying, One Course, per Session	20 00
Assaying Laboratory, per Session	10 00
Chemical Laboratory, per Session	20 00
Petrographical Laboratory, per Session	10 00
Mechanical, Electrical or General Engineering Laboratory, per Session	20 00

Fees for M.Sc. Work

*Total Sessional Fee (including laboratory fee, and student interests)	$117 75
Laboratory deposit	10 00

Additional charges may be made in the case of students requiring special material and apparatus.

*If a student decides to spread his work over two years, he will pay each year $75.00 for total sessional fee, and $10 for laboratory deposit.

In addition to regular examination fees, supplemental or otherwise, there will be the following fees for special examinations:

Examination in one paper	$ 5 00
Examination in two or more papers	10 00

GRADUATION AND OTHER FEES

The Graduation Fee is payable before March 15. This fee is returned to unsuccessful candidates.

Extra fee for degree in absentia	$ 10 00
Graduation B.Sc.	20 00
" M.Sc.	20 00
Admission *ad eundem statum*	10 00

DEGREES.

I. Bachelor of Science.

1. The degree of B.Sc. will be given on the satisfactory completion of a four years' course in any one of the following departments:—

A. Mining and Metallurgical Engineering.
B. Chemistry.
C. Mineralogy and Geology.
D. Chemical and Metallurgical Engineering.
E. Civil Engineering.
F. Mechanical Engineering.
G. Electrical Engineering.
H. Physics.

A graduate in any course who desires to take the degree of B.Sc. in any other course, or a student desiring to change from one course to another, shall take all the classes which he has not already passed, in that course, or, by examination satisfy the Department in charge of those classes as to his knowledge of the subjects involved.

2. The degrees of B.A. and B.Sc. will be given on the satisfactory completion of a six years' course in Arts and Science according to the description, page 50.

A candidate for graduation must have completed either a four or a six years' course and have passed all the required examinations.

II. Master of Science.

The degree of Master of Science (M.Sc.) is granted to candidates who have graduated as B.Sc. and thereafter have spent at least one full session in attendance at the Faculty of Applied Science.

The work prescribed will consist of two parts as follows:

A. Research and Thesis representing not less than half the session's work. Except by special permission the thesis must be submitted by April 30. A candidate who is allowed to postpone must submit his thesis by September 20 if he desires a degree at the fall convocation.

B. One or both of the following which shall be cognate to the field of study and shall be tested by examinations.

(a) Prescribed lecture courses. These shall, except by special permission of the Faculty, be advanced courses (i.e. courses not offered for any B.Sc. degree). Where allowed to take an undergraduate course, the candidate shall pass a special examination of a standard higher than is exacted from B.Sc. candidates.

(b) Directed special studies with reports.

Written examinations will be set on the lecture courses prescribed and also on the directed special studies and a minimum standing of second division must be made on each paper.

An oral examination will be given on the subject of the thesis.

Candidates must apply for permission to enter a M.Sc. course at least one week before the opening of the session.

No candidate, who has not made an average of second division in his final year, will be accepted for the M.Sc. course except by special recommendation of the Department concerned.

A committee consisting of the Vice-Principal, the Dean, the Head of the Department concerned and the Professor or Instructor selected to supervise the candidates work shall report to the Faculty on his fitness to enter a M.Sc. course and recommend to the Faculty the prescribed programme of work.

A candidate in full time employment in the University or elsewhere will not normally be accepted as a candidate for the M.Sc.

DOMINION LAND SURVEYORS.

Revised Statutes Canada Chap. 117 Sec. 22, 1927

Every person who has followed a regular course of study in all the branches of education required for this act for admission as a Dominion Land Surveyor in any college or university where a complete course of theoretical and practical instruction in surveying is organized, and who, after examination, had thereupon received from such college or university a degree attesting to his completion of the said course of instruction, which degree shall be the degree of Bachelor of Science ———— shall be exempt from serving three years as aforesaid as an articled pupil, and shall be entitled to examination for a commission after being admitted upon examination as aforesaid as an articled pupil, and serving one year under articles with a Dominion Land Surveyor including six months actual service with him in the field. ————

ONTARIO LAND SURVEYORS.

Revised Statutes Ontario 1927, Chap. 201, Sec. 28 (1).

The privilege of a shortened term of apprenticeship shall also be accorded to any graduate of the ———— or to any graduate in Civil Engineering or of Mining Engineering ——— of Queen's University at Kingston, and such person shall not be required to pass the preliminary examination for admission to apprenticeship, and shall only be bound to serve under articles with a practicing surveyor, duly filed as required by section 31, during twelve successive months of actual practice after which on complying with all the other requirements he may undergo the examination for admission to practice.

COURSES.

A. Mining and Metallurgical Engineering.
B. Chemistry.
C. Mineralogy and Geology.
D. Chemical and Metallurgical Engineering.
E. Civil Engineering.
F. Mechanical Engineering.
G. Electrical Engineering.
H. Physics.

FIRST YEAR, ALL COURSES.

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page.
English	2	0	52
Mathematics I.	2	0	54
Mathematics II.	2	0	54
Mathematics III.	2	0	54
Mathematics IV.	2	0	55
Astronomy I	2b	0	56
Projection	0	2	110
Physics I, & II	4	2	57, 58
Chemistry I.	3	3	63
Drawing I.	0	5	109
Surveying I.	0	2	97
Physical Drill	0	2	111

SECOND YEAR

Courses A, B, C, D.

Mathematics V.	3	0	55
Descriptive Geometry	0	5a	110
Physics III.	2	2	58
Physics IV. (a)	1a	2a	58
Qualitative Analysis I.	2	6	65
Mineralogy I.	1	2	76
Geology I.	2	0	72
General Engineering I.	2	0	90
Surveying III.	1	3	97
Drawing II.	0	5b	109

Courses E, F, G,

Mathematics V.	3	0	55
Astronomy II.	1	0	56
Descriptive Geometry	0	5a	110
Physics III.	2	2	58
Physics IV.	1	2b	58
General Chemistry II.	2	0	64
General Engineering I.	2	0	90
Mechanical Engineering IX.	1	2	105
Surveying II.	1	3	97
Drawing III.	0	2a 5b	109
Shop Work	0	3	108

A.—MINING AND METALLURGICAL ENGINEERING.

This course is necessarily a very broad one, so that it may give a foundation for whatever branch of these professions a graduate may follow. Experience has shown that graduates do not usually follow any narrow differentiation which they make during their course, but are governed by many other factors in the practice of Mining and Metallurgical Engineering. These factors are often out of their control, and the wisest plan in a four years' course appears to be, not to specialize, but by a broad training, in the final years, to obtain a suitable introduction to any branch of the work.

There are, however, some well known avenues towards professional work, such as a good training and a manipulative skill in drafting, chemical analysis, and surveying. These subjects are common and imperative to almost any professional position in mining and metallurgy, therefore they are perfected as far as is possible while at college.

At the present time there are no summer classes, or summer field work in mining or metallurgy. Under these conditions the student can, usually, obtain practical and remunerative work during four or five months each summer. This work, if in connection with Mining, Metallurgy or Surveying is considered to be more useful as a training than practical work under academic supervision.

Visits are paid to mines and smelters. One trip at least is required of each student, the expense not to be more than twenty-five dollars.

First and Second Years.

See Page 37.

Third Year

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page.
Quantitative Analysis I.	1	3	66
Mineralogy III.	2a	2a	77
Mineralogy IV.	1	2	78
Geology III.	2b	2b	72
Mining I.	1a, 2b	1a	79
Ore Dressing	1a, 2b	0	82
Metallurgy II.	2	0	84
Thermodynamics I.	2a	0	106
General Engineering V.	1	2	91
General Engineering III.	0	2	90
Electrical Engineering I.	2	2	99
Surveying V.	1a	3a	98
Fire Assaying	1b	3b	86

FOURTH YEAR

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page.
Mechanical Engineering IV.	2a, 1b	0	103
Geology V.	1b	0	73
Geology VIII.	2a, 3b	0	74
Hydraulics I.	2	0	93
Metallurgy IV.	3	0	84
Milling	0	10	82
Mining II.	4a, 3b	0	80
Mining III.	0	6	81
Geophysical Prospecting	1	0	81
Economics	2	0	53
Summer Essay			86

B.—CHEMISTRY (Industrial and Research)

This course is designed to fit men for the profession of expert chemists, teachers of chemistry, specialists in all lines of industrial professions where chemistry serves as the basis of the industry.

The great need for men well equipped for the profession of chemist is shown in the increasing demands coming to all universities for such men. Graduates are fitted to do constructive work in research laboratories and in industrial plants.

FIRST AND SECOND YEARS.

See Page 37.

THIRD YEAR

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page.
Quantitative Analysis II.	2	8a 5b	66
Industrial Chemistry II.	2	3	69
Physical Chemistry I.	2	3	67
Organic Chemistry I.	2	3	65
Inorganic Chemistry III.	2	0	63
Physics XIV.	0	2a	62
Metallurgy II.	2	0	84
Bacteriology	0	3b	71
German	3	0	52

FOURTH YEAR

Organic Chemistry II.	2	6	65
Physical Chemistry II.	2	3	67
Physical Chemistry III.	2	3a	68

FOURTH YEAR

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page.
Industrial Chemistry IIIa.	2a	3a	69
General Chemistry IIIb.....	2b	3b	64
Colloid Chemistry Ib.	1b	2b	70
Economics I.	2	0	53
German	3a	0	52
Reports and Essays	0	2	70
Option in Chemistry			
General and Inorganic Chemistry IV, Organic Chemistry IV, Quantitative Analysis IV, Physical Chemistry IV or Industrial Chemistry IV.	0	3a, 6b	63-70

C.—MINERALOGY AND GEOLOGY.

This course is designed to meet the requirements of students who desire a theoretical and practical knowledge of the constitution and history of the Earth. It furnishes a foundation for the professions of mineralogy, geological surveying, mining and consulting geology, and is useful for those who will in any way be connected with the discovery or the development of the mineral resources of the country. It forms a good preliminary course for the mining engineer who wishes to understand thoroughly the groundwork of his profession. Since a knowledge of chemistry is essential for proper comprehension of many mineralogical and geological phenomena, considerable stress is laid on this science in the earlier part of the course. The departments of mineralogy and geology are furnished with well equipped laboratories for the physical and chemical examination of minerals, rocks and ores, and also with collections of illustrative material. Miller Hall, a very fine building in memory of the late W. G. Miller, was completed in 1931 and has a large museum on the main floor with fine specimens of minerals and fossils. While field excursions are made during the session, students are advised to spend the summer vacations in practical field work.

FIRST AND SECOND YEARS.

See Page 37

THIRD YEAR

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page.
Quantitative Chemistry I.	1	3	66
Physical Chemistry I.	2	3	67
Mineralogy II.	2b	0	77
Mineralogy III.	2a	2a	77
Mineralogy IV.	1	2	78
Mineralogy V.	0	2	78
Geology II.	3	0	72
Geology III.	2b	2b	72
Metallurgy II.	2	0	84
Ore Dressing	1a, 2b	0	82
Surveying V.	1a	3a	98
Reports	0	3	

FOURTH YEAR

Mineralogy VI	2	0	78
Geology V.	1b	0	73
Geology VI.	2	0	73
Geology VII.	0	2	74
Geology VIII.	2a, 3b	0	74
Geology X.	0	3	74
Mining IV	2a, 1b	0	81
Assaying	1b	3b	86
Biology	2a	0	*
Geophysical Prospecting	1	0	81
Economics I.	2	0	53
German	3	0	52
Advanced Analysis and Thesis	0	9	79

*See Biology II.—Arts.

D.—CHEMICAL AND METALLURGICAL ENGINEERING.

In the construction and operation of chemical works and metallurgical plants the services of men who combine a thorough knowledge of chemistry with an education in engineering are required. The course in Chemical and Metallurgical Engineering gives a training along both these lines, including a grounding in a competent knowledge of those materials of construction and the special kinds of plants and processes which are in use in the works mentioned.

The first two years of the course are the same as those in the courses in Chemistry and in Mining and Metallurgy.

Specialization begins in the third year, part of the time in this year being devoted to the study of Chemistry or of Chemistry and Metallurgy and part to Civil and Mechanical Engineering. On entering the third year, students choose those optional subjects more especially relating to Chemical Engineering or to Metallurgy.

This specialization is continued in the fourth year, which enables students to pursue advanced work in Chemical Engineering, Metallurgy, and Chemistry.

Visits are paid to local and to at least one outside chemical or metallurgical works, attendance being required. Chemical Engineering Students make a trip in their fourth year. Metallurgy students are required to make only one outside trip, which may be that specified for course A. or Dc. The expense of the trip to each student is not over twenty-five dollars.

First and Second Years.

See Page 37

Third Year

Chemical Engineering, Dc.

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page.
Quantitative Chemistry I.	1	3	66
Physical Chemistry I.	2	3	67
Industrial Chemistry II.	2	3	69
Thermodynamics I.	2a	0	106
General Engineering V.	1	2	91
General Engineering III.	0	2	91
Electrical Engineering I.	2	2	99
Mechanical Engineering I.	2a	0	102
Mechanical Engineering III.	0	3a	103
Chemical Engineering I.	2b	0	87
Organic Chemistry I.	2	2a, 4b	65
Quantitative Chemistry I. Laboratory	0	2b	66

Metallurgical Engineering, Dm.

Quantitative Chemistry I.	1	3	66
Physical Chemistry I.	2	3	67
Industrial Chemistry II.	2	3	69
Thermodynamics I	2a	0	106
General Engineering V.	1	2	91
General Engineering III	0	2	91
Electrical Engineering I.	2	2	99
Mechanical Engineering I.	2a	0	102
Mechanical Engineering III	0	3a	103
Metallurgy II.	2	0	84
Metallurgy III.	1b	0	84
Ore Dressing	1a, 2b	0	82
Fire Assaying	1b	3b	86

FOURTH YEAR

Chemical Engineering, Dc.

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page.
Physical Chemistry II.	2	3	67
Mechanical Engineering IV.	2a, 1b	0	103
Structural Engineering III.	0	2	93
Chemical Engineering II.	2	3	87
Chemical Engineering III.	1	6	88
Metallurgy II.	2	0	84
Ore Dressing	1a, 2b	0	82
Thermodynamics III.	2	3a	106
Hydraulic Engineering I.	2	0	93
Shop Work	0	3b	108
Economics I.	2	0	53

Metallurgical Engineering, Dm.

Physical Chemistry II.	2	3	67
Mechanical Engineering IV	2a, 1b	0	103
Metallurgy IV.	3	0	84
Metallurgy VI.	1b	0	84
Metallurgy V.	1	0	84
Metallurgy VII.	0	2	85
Metallurgy Lab.	0	3	85
Hydraulic Engineering I.	2	0	93
Milling	0	7	82
Mining IV	2a, 1b	0	81
Metallography	1	3	85
Economics I	2	0	53

E.—CIVIL ENGINEERING.

In this course the two main divisions of Civil Engineering, namely Surveying and Draughting, on the one hand, and Structural Design and Construction on the other, receive full consideration. During the earlier years of the course a sound training along engineering lines is given in Mathematics, Physics, Mechanics and other allied subjects, which are essential to the proper education of an engineer. The student is also made familiar with the use of the various instruments, and by many hours of practical work in the field and draughting room, becomes skilled in the ordinary operations of Surveying. During the same period the foundation work for structural

design is laid by courses of lectures in materials of construction, as well as by demonstrations and practical work in the testing laboratories. During the final years more highly specialized instruction and training are given along the lines of the two main divisions, with particular regard to the economic conditions of modern construction. At frequent intervals excursions are undertaken to the quarries, cement works, brick kilns, bridges, railway structures, canals and graving docks, which are to be found within easy distance of Kingston.

First and Second Years.

See Page 37

Third Year

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page.
Metallurgy I.	1	0	83
Thermodynamics I.	2a	0	106
General Engineering II.	2	0	90
General Engineering III.	0	2	91
General Engineering VI.	1	3	92
Structural Engineering I.	1	3	92
Hydraulic Engineering I.	2	0	93
Surveying IV.	1	3	98
Municipal Engineering I.	2b	0	95
Railway Engineering I.	2a, 1b	3	94
Electrical Engineering I.	2	2	99
Geology IX.	2	0	74

Fourth Year

Industrial Chemistry I.	1	0	69
General Engineering IV.	0	2a	91
Railway Engineering II	1	3	94
Municipal Engineering II.	2b	2	95
Municipal Engineering III.	1	1	95
Highway Engineering I.	2a	3a	96
Structural Engineering II.	2	5	92
Structural Engineering IV.	1	5	93
Mechanical Engineering IV.	2a, 1b	0	103
Hydraulic Engineering II.	2	0	94
Hydraulic Engineering III	0	2b	94
Economics I.	2	0	53
Engineering Economics	1	0	95

F.—MECHANICAL ENGINEERING.

The profession of Mechanical Engineering embraces the design, manufacture and operation of all classes of machinery, of power plants and manufacturing plants, as well as the executive management of industries. A four years' course therefore must be broad enough to give the student a thorough training in the fundamental principles, and any sub-divisions intended to train a student for any one of the many specialties only, seem unwise, and are impracticable on account of the lack of time.

The first two years are devoted to the study of the fundamental subjects of Mathematics, Physics, Chemistry and Mechanics, including experimental work in the various laboratories. Special attention is given to the subject of strength of materials, with practice in testing during the second and third years. The study of the steam engine and other forms of heat-engines, includes courses in Thermodynamics, Valve Gears, Governors and the Balancing of Engines. Instruction is given in Mechanism, Machine Design, Shop Work, and the fundamental principles of Electrical Engineering. Instruction in drawing extends over the four years, and gives a thorough drill in modern drafting room practice. In the more advanced courses of the fourth year the student is taught how to apply the general principles to the design and operation of special machinery, steam and gas engines, steam boilers and gas producers, and complete power plants; *i.e.*, each student is allowed to specialize as far as is practicable. The instruction in the laboratories is intended not only to familiarize the student with standard methods of testing, but also to teach him how to attack original problems.

The fourth year students are kept in touch with the local manufacturing concerns in order to familiarize them with modern power plant and shop practice

FIRST AND SECOND YEARS.

See Page 37

THIRD YEAR

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
Mathematics VI. ..	2a	0	55
Thermodynamics I. ..	2a	0	106
Thermodynamics II. ..	1b	0	106
Thermodynamics V. ..	1	2	107
General Engineering III. .	0	2	91
General Engineering V.	1	2	91
Electrical Engineering IV.	2	2	99
Metallurgy I. . .	1	0	84
Mechanical Engineering I. . .	2	0	102
Mechanical Engineering II. ..	2b	0	103
Mechanical Engineering III.	0	6	103
Mechanical Engineering IV.	2a, 1b	0	103
Shop Work ..	0	3	108
Hydraulic Engineering I.	2	0	93

FOURTH YEAR

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page.
Industrial Chemistry 1.	1	0	69
Thermodynamics III.	2	3a	106
Thermodynamics IV.	0	6	107
Electrical Engineering VII	1	2	100
Mechanical Engineering V.	3	6	103
Mechanical Engineering VI.	2a, 1b	0	104
Mechanical Engineering VIII.	0	3b	105
Mechanical Engineering XI.	2b	0	105
Hydraulic Engineering II.	2	0	94
Metallurgy VIII.	0	2a	85
Economics I.	2	0	53

G.—ELECTRICAL ENGINEERING.

The instruction in the first two years of the course in Electrical Engineering provides for a thorough training in the fundamental subjects of Mathematics, Physics, Chemistry and Mechanics, including suitable work in the various laboratories. Part of the time is devoted to elementary drawing and shop work. In the third year the work consists of an introduction to the general principles underlying all electrical work together with elementary laboratory work. Considerable time is devoted to the study of Thermodynamics together with more advanced Mathematics and Physics. The fourth year is devoted to the study of the theory and action of the main types of electrical apparatus, the design and operation of central stations, electric lighting, electric railways and power transmission together with a thorough grounding in the principles underlying the electron tube.

An important part of the work consists in the working out of problems such as are frequently met with in practical work. In this way the student is trained in the application of theory to the solution of practical problems.

Arrangements are made for occasional visits to electrical works.

The whole course is designed to give the student a thorough understanding of the general principles which constitute the basis of all electrical

work, together with a knowledge of how these principles are applied in practice. No effort is made to give that intimate knowledge of practical details which experience alone can supply.

Students are advised not to enter Course G unless they have taken a high standing in Physics III., Physics IV., and Mathematics V.

First and Second Years.

See Page 37

Third Year

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page.
Mathematics VI. ..	2a	0	55
Mathematics VII. ..	2b	0	55
*Physics V.	1	3	59
Thermodynamics I. ..	2a	0	106
Thermodynamics II. ..	1b	0	106
General Engineering III.	0	2	91
General Engineering V.	1	2	91
*Electrical Engineering II.	2	2	99
*Electrical Engineering III.	3	3	99
Mechanical Engineering I.	2	0	102
Mechanical Engineering II.	2b	0	103
Mechanical Engineering VII.	0	3	104
Metallurgy I. ..	1	0	83
Hydraulic Engineering I. ..	2	0	93

Fourth Year

Thermodynamics III. ..	2	3a	106
Electrical Engineering V. . .	4	6	100
Electrical Engineering VIII. ..	1	3	100
Electrical Engineering XII	2	3b	101
Hydraulic Engineering II	2	0	94
Hydraulic Engineering III.	0	2a	94
Metallurgy VI. ..	1b	0	84
Economics I. ..	2	0	53

One of the following classes:—

Electrical Engineering IX. ..	1	3	100
Electrical Engineering X. ..	1	3	100
Electrical Engineering XI.	1	3	101

*Students must pass these subjects before entering the fourth year.

H.—PHYSICS.

This course is designed to fit men for positions as physicists in research laboratories.

The importance of a thorough grounding in the fundamental subjects of Physics, Mathematics, and Chemistry, cannot be over-emphasized, so these subjects form the major part of the course. The engineer's point of view is secured from the classes of the Faculty of Applied Science, while the breadth of view, necessary for a research worker, is gained from the advanced theoretical classes in the major subjects of the course. Students contemplating taking this course are urged to acquire a reading knowledge of French and German as early in the course as possible.

First Year

See Page 37

Second Year

The Second year of any Course, See Page 31.

Third Year

	Lect. Hrs. per week.	Lab. Hrs. per week.	Page
Mathematics VIII.	3a	0	56
Mathematics IX.	3b	0	56
Physics V.	1	3	59
Physics VI.	2b	3b	60
Physics VII.	2a	3a	60
Physics VIII.	2b	0	60
Quantitative Analysis I.	1	3	66
Electrical Engineering II.	2	2	99
German	3	0	52

Fourth Year

Mathematics X.	3a	0	56
Mathematics XI.	3b	0	56
Physics IX.	3a	0	61
Physics X.	2b	0	61
Physics XI.	2b	0	61
Physics XII.	2a	0	61
Physics XIII.	0	9	62
Electrical Engineering VIII	1	3	100
Electrical Engineering XII	2	3b	101
German or French	3	0	52-53
Economics I.	2	0	53

GRADUATE YEAR IN COMMERCE.

The demand for engineers with business training has led to the establishment of a year's work in Commerce for graduates in Engineering of Queen's and other Universities.

The purpose of this course is to aid in preparing men who already have the technical equipment for work in the administrative or financial branches of industry.

A certificate will be awarded to students successfully completing the course.

Students who have not had an elementary course in Economics should read in preparation Clay, *Economics for the General Reader,* or McGibbon, *Elementary Economics for the Canadian Reader.*

The year's work will consist of five full courses or their equivalent, as follows:

1. Accounting and Statistics.
2. Industrial Management and Personnel Administration.
3. Business Finance.
4. Principles of Marketing *or* Money, Banking and International Trade.
5. Two half courses to be selected (e.g. Commercial Law, Investments, Cost Accounting, Transportation, Labour Problems).

For more detailed description of Courses, see the Announcement of the Courses in Commerce and Administration.

GRADUATE COURSE IN GEOLOGY

The establishment of the Miller Memorial Research Chair in Geology has made it possible to give a year's graduate work in Geology.

The courses are planned to give to those men who have graduated in Mining, Engineering the additional training in Geology that is needed for those who intend to undertake exploration and development work.

For those who intend to make Geology their profession, a year's work satisfactorily completed at Queen's is equivalent to a year's graduate work at other universities and is accepted as such at some of the important graduate schools in Geology. It has the advantage of giving to graduates who intend

to practice their profession in Canada an opportunity to study Canadian localities and problems in more detail than is otherwise possible since the collections of material from the important mineral deposits of the Canadian shield are large and fairly complete and there is, in addition, the opportunity for field study of the Pre Cambrian rocks occurring in the vicinity of Kingston.

Graduates in courses A and C in the Faculty of Applied Science at Queen's University and graduates in equivalent courses of other universities may proceed to the M.Sc. degree. (See p. 35). The courses are open only to graduates.

COURSE FOR B.A. LEADING TO THE DEGREES OF B.A. AND B.Sc. IN SIX YEARS.

Students taking these courses are required to have Arts Matriculation and to register the first two years in Arts alone and pay the class and registration fees in Arts, to register the second two years in both Arts and Science, to pay both registration fees, with examination fees as required, and the Science class fees and to register the last two years in Science only, paying the registration and class fees. Arts classes are subject to the regulations in the Arts Calendar, and Science classes to the regulation in the Science Calendar.

The courses for B.A. and B.Sc. must be taken as laid down in the following scheme. The regulations regarding back classes on page 30 will be applied on these courses.

FIRST YEAR

1. English 1.
2. French 1 or German 1.
3. Mathematics 1.
4. Mathematics IV. (Science).
5. Astronomy I. (Science).
6. Physics 1.
7. General Chemistry 1.

SECOND YEAR

1. English 2.
2. French 2 or German 2; or Latin, Greek, or Spanish.
3. Philosophy 1 or 2.
4. 5. Two of History 1, 2, 3, Economics 2.

THIRD YEAR

1. Course from Group I.
2. Course in a subject previously taken but not covered by the later courses in science.
3. Mathematics I., II., and III.
4. Surveying I.
5. Drawing I.
6. Projections I.

The degree of B. A. will be conferred on candidates who complete four years work with a minimum standing of fifty per cent. and sixty-two per cent. in half their classes.

FOURTH, FIFTH, AND SIXTH YEARS.

The fourth, fifth, and sixth years are the same as the second, third, and fourth years of the B.Sc. Courses.

If a student on one of these courses wishes to specialize in one or more of the Arts subjects, he may do so in the honour classes.

Attention is called to the fact that by proper selection of classes an entire Arts course leading to the degree M.A. and a B.Sc. course in the Faculty of Applied Science can be completed in seven years.

SUBJECTS OF STUDY

ENGLISH

LECTURERS—

MAGNUS H. IRVINE, M.C., M.A.
E. E. DUTHIE, M.A.

FIRST YEAR ENGLISH

The writing of fortnightly compositions and the study of the following prescribed texts.

Norman Foerster and J. M. Steadman, *Writing and Thinking.* (Boston Houghton, Mifflin Co.)

R. S. Loomis: *Freshman Readings.* (Boston: Houghton Mifflin Co.)

R. M. Gay: *The College Book of Verse,* (Boston: Houghton Mifflin Co.)

LECTURES—Sections 1-2, *Monday* and *Wednesday* 8-9.
Sections 3-4, *Tuesday* and *Thursday* 3-4.
Sections 5-6, *Monday* and *Wednesday* 1-2.
Sections 7-8, *Tuesday* and *Thursday* 10-11.

GERMAN.

ASSISTANT PROFESSOR O. L. BOCKSTAHLER, M.A., Ph.D.

GERMAN A.—PREPARATORY COURSE.

For students in Courses B. and H. third year and fourth year students in Course C.

This course is intended to meet the needs of students who enter the University with little or no knowledge of German. It is taken by students who need it to complete their Matriculation, or who desire to pursue a course in which German text-books or works of reference are prescribed or recommended. The requirements correspond generally to those for Junior Matriculation The course will count towards a degree.

Text Books:

Hagboldt & Kaufmann—*Deutsch für Anfänger*—(Univ. of Chicago Press).
Hagboldt & Kaufmann—*Lesebuch für Anfänger*—(Univ. of Chicago Press).
(Deutsch für Anfänger and Lesebuch für Anfänger must be purchased together).
Alexis & Pfeiler—*In Deutschland*—(Midwest Book Co.).
Fiedler & Sandbach—*A First German Course for Science Students*—(Oxford).

Lectures—Sect. 1—*Tuesday, Thursday and Saturday at* 8.
Sect. 3—*Monday, Wednesday and Friday at* 8.

GERMAN 3a—SCIENTIFIC GERMAN

For fourth year students in Courses B. and H. or any Science students.

This course is designed for students who are doing advanced work in chemistry, physics, geology and mineralogy. The reading will be selected to suit members of the class. Prerequisite: German A, or Matriculation in German.

Text-books:

Greenfield, *An Introduction to Chemical German.* (Heath.)
Dippold—*Scientific German Reader* (Ginn.)
Wait—*German Science Reader* (Macmillan.)
Scientific Journals bearing on each students special field.

LECTURES—*Tuesday, Thursday and Saturday at* 9.

FRENCH.

FRENCH A.

LECTURER—MME MCCONNELL, Brevet Supérieur, C.A.P.

The work of this class is intended for those who have not Pass Matriculation or its equivalent.

Fraser and Squair: *High School French Grammar.*

The French Reader (Ryerson Press).

LECTURES—*Monday, Wednesday and Friday at* 2.

FRENCH I

For prescription, hours and instructors, see the Arts Calendar.

ECONOMICS

ASSOCIATE PROFESSOR OF COMMERCE.—C. E. Walker, B.Sc. Acc., C.A.

ECONOMICS *I.*

Required of Fourth Year Students in all courses.

A study of the economic and business problems of the engineer with regard to the organization, financing and management of engineering enterprises and the preparation and purpose of accounting and cost records. The course will also include a discussion of law as applied to the business problems dealt with.

Assigned Readings.

Lectures—Monday and Wednesday at 9.

MATHEMATICS.

PROFESSOR—J. Matheson, M.A.

PROFESSOR—C. F. Gummer, M.A., Ph.D.

PROFESSOR—N. Miller, M.A., Ph.D.

ASSISTANT PROFESSOR—K. P. Johnston, B.A., B.Sc.

LECTURERS—G. L. Edgett, M.A., Ph.D.; J. O. Watts, M.A.;
R. W. Stevens, B.Sc.

MATHEMATICS I

For first year students in all courses.

TRIGONOMETRY, to cover spherical trigonometry and a review of the more important parts of plane trigonometry.

Sections 1-4, *Tuesday* and *Thursday* 2-3.
Sections 5-8, *Tuesday* and *Thursday* 9-10.

Mr. Stevens and Mr. Watts.

MATHEMATICS II

For first year students in all courses.

CALCULUS. A course covering differentiation and the simpler methods of integration with applications to rates, maxima and minima and the finding of areas, volumes, surfaces, fluid pressure, centres of gravity, moments of inertia, etc.

Text Book—Phillips, *Calculus* (John Wiley & Sons).
Sections 1-2, *Tuesday* and *Thursday* 3-4.
Sections 3-4, *Tuesday* and *Thursday* 1-2.
Sections 5-8, *Tuesday* and *Thursday* 11-12.

Professor Gummer, Professor Miller, Dr. Edgett, and Mr. Watts.

MATHEMATICS III

For first year students in all courses.

ANALYTIC GEOMETRY. A review of the geometry of the straight line and circle, and a study of the conics and other plane curves of importance in engineering.

Text Book—Tanner and Allen, *Brief Course in Analytic Geometry,* (American Book Company).

Sections 1-4, *Wednesday* 10-11, *Saturday* 10-11.
Sections 5-8, *Wednesday* 3-4, *Saturday* 9-10.

Professor Gummer, Mr. Stevens and Mr. Watts.

MATHEMATICS IV

For first year students in all courses.

Synthetic Solid Geometry, covering the properties of the principal solid figures, methods and formulae for areas and volumes, etc.

Sections 1-4, *Monday* and *Friday* 10-11.
Sections 5-8, *Monday* and *Friday* 3-4.

Professor Johnston and Dr. Edgett.

MATHEMATICS V

For second year students in all courses.

Calculus and Algebra. This course continues the Calculus of Mathematics II., and covers certain important parts of Algebra. It includes such topics as curvature, convergence of series, Taylor's series with applications, determinants, partial fractions, continued fractions, solution of numerical equations, integration of more difficult forms with applications and simple differential equations.

Text Books—Phillips, *Calculus* (John Wiley and Sons) Siceloff and Smith, *College Algebra,* (Ginn and Co.)

Monday, Wednesday and Friday, 11-12.

Professor Miller and Dr. Edgett.

MATHEMATICS VI

For third year students in courses F. and G.

A continuation of Mathematics V. to cover certain topics in analytic solid geometry and in addition. partial differentiation, maxima and minima for functions of several variables, double and triple integration and simple differential equations with applications.

Text Book: Phillips, *Calculus* (John Wiley and Sons).
Wednesday and Friday, 10-11, first term.

Professor Miller.

MATHEMATICS VII.

For third year students in course G.

A continuation of Mathematics VI, to include such topics as systems of coaxial circles, hyperbolic functions, the catenary, a more detailed study of differential equations and the use of the complex variable.

Wednesday and Friday, 10-11, second term.

Professor Miller.

MATHEMATICS VIII.

For third year students in course H.

A course in Determinants and Theory of Equations.

Text Book: Dickson, *First Course in Theory of Equations,* (John Wiley and Sons).

Monday, Wednesday and Friday, 8-9, first term.

Professor Johnston

MATHEMATICS IX.

For third year students in course H.

A course in Calculus to follow Mathematics V. This course will emphasize the theoretical side of the subject, and prepare for advanced study.

Text Book: Granville, Smith and Longley; *Differential and Integral Calculus* (Ginn & Co.)

Monday, Wednesday and Friday, 11-12, second term.

Professor Gummer.

MATHEMATICS X.

For fourth year students in course H.

A course in Analytic Solid Geometry involving a study of various solid figures and of the general properties of surfaces. Introduction to Differential Geometry.

Text Book: Snyder and Sisam, *Analytical Geometry of Space* (Holt).

Tuesday, Thursday and Saturday, 8-9, second term.

Professor Gummer

MATHEMATICS XI.

For fourth year students in course H.

A course in differential equations to include the more important methods of solution of ordinary differential equations, and a brief introduction to partial differential equations.

Tuesday, Thursday and Saturday, 8-9, second term.

Professor Miller

ASTRONOMY I

For first year students in all courses.

ASTRONOMY, including the fundamental principles of the subject, such as the systems of co-ordinates, the shape and motions of the earth, the motions of the moon, planetary motion, time.

Sections 1-4, *Monday and Friday* 3-4, second term.

Sections 5-8, *Monday and Friday* 10-11, second term.

Professor Johnston and Dr. Edgett.

ASTRONOMY II.

For second year students in courses E. F. G. and H.

Applications of spherical Trigonometry to Geodesy and Astronomy. The method of least squares.

Tuesday, 10-11. Professor Johnston

PHYSICS.

PROFESSOR—A. L. Clark, B.Sc., Ph.D., F.R.S.C.

RESEARCH PROFESSOR—J. A. Gray, B.Sc., D.Sc., O.B.E., F.R.S.C.

PROFESSOR—W. C. Baker, M.A.

PROFESSOR—J. K. Robertson, M.A., F.R.S.C.

PROFESSOR—E. Flammer, B.Sc., Ph.D.

LECTURERS—H. M. Cave, M.A., Ph.D.; B. W. Sargent, M.A.; E. E. Watson, M.Sc., Ph.D.

DEMONSTRATORS—H. G. Conn, B.Sc.; W. C. Little, B.Sc.; R. Seright, B.Sc.

The work in Physics is carried on in lecture and laboratory courses, which run parallel to each other. In the lecture room the fundamental principles are developed and applied, experimental demonstrations given and many problems solved. In all classes in Physics weekly exercises are required of students. In the laboratory a large number of experiments are performed. These are designed to train the student in manipulation of apparatus and instruments of precision, to teach him to make accurate measurements and to give practice in properly recording, interpreting and reducing experimental data.

In all the courses in Physics, the work in the laboratories will be counted as a certain percentage of the whole work of the session. In estimating the standing in the laboratory work, both the quantity and quality of the work done will be considered.

Physics I. and II., together forming a complete introductory course, are taken by all first year students. Previous knowledge, though valuable, is not required. The laboratory work of this year is arranged to supplement the lectures in both Physics I. and II., and credit for this work is given on the written papers in both subjects. Students in both classes have opportunity for assistance by Douglas Tutors. (See page 29).

PHYSICS I.

Required of all first year students.

The subjects dealt with include the elementary treatment of uniformly accelerated motion, Newton's Laws and their application as the basis of Mechanics, Vector addition applied to simple cases of forces, velocities, momenta, etc., Work, Power, Moments, Simple cases of Centre of Mass and of Equilibrium, the application of mechanical ideas to the elementary statics of liquids and gases.

LECTURES—Sections 1-4, *Monday* 11-12, *Saturday* 9-10.
LECTURES—Sections, 5-8, *Monday* 4-5, *Saturday* 8-9.

Professor Baker and Dr. Watson.

PHYSICS II.

Required of all first year students.

A course of lectures of two hours per week on Magnetism, Electricity, Wave Motion, Sound, Light and Heat. These topics are discussed mathematically and illustrated by experiments.

LECTURES—Sections 5-8, *Wednesday* 4-5, *Friday* 2-3.
LECTURES—Sections 1-4, *Wednesday* and *Friday* at 11.

Dr. Cave and Dr. Watson

Laboratory—Sect. 1. *Monday,* 1-3, *Sect.* 2. *Monday,* 3-5.
Section 3, *Thursday* 8-10, Section 4, *Thursday* 10-12.
Section 5, *Monday* 8-10, Section 6, *Monday* 10-12.
Section 7, *Thursday* 1-3, Section 8, *Thursday* 3-5.

Mr. Conn, Mr. Little and Mr. Seright.

PHYSICS III.

This class is required of all students in the second year.

This course of lectures is a continuation of Physics I. Mathematics V is taken at the same time as this class, consequently during the latter part of the year the Calculus is used freely. A general review of the important fundamental principles of Physics occupies the first few weeks. These are then applied to problems dealing with Motion in a Circle, Simple Harmonic Motion, Composition of Simple Harmonic Motions with applications, Moments of Inertia, Rotation, Friction of Belts, Pivots and Bearings, Elasticity in Stretching, Bending and Twisting, Energy and its Transformations.

The laboratory work, which runs parallel with the lectures, is a continuation of the work of the first year.

Lectures—Monday and Friday, 9-10.

Dr. Watson and Dr. Cave.

Laboratory—A, B, C, D,—Sect. 1—*Tuesday* 1-3. Sect. 2—*Tuesday* 3-5.
E, F, G, Sects. 1, 2—*Friday,* 1-3, Sects. 3-4—*Friday,* 3-5.
Prof. Flammer, Dr. Watson, Mr. Conn and Mr. Sargent.

PHYSICS IV. (a)

This class, which is required of students in the second year in Courses A, B, C, D, consists of (a) one lecture per week during the first term, (b) two hours laboratory per week, during the first term.

In the lectures, which deal quantitatively with direct currents, there is a discussion of such topics as Magnetism, Electromagnetism, Electromagnetic Induction, and the basic principles of electrical instruments.

The laboratory course includes a series of experiments designed to illustrate the lectures and to train the student in the taking of standard electrical measurements. Instruction in the laboratory may occasionally be supplemented by short explanatory talks.

Lectures—Tuesday, 11-12, first term. Professor Robertson.

Laboratory—A, B, C, D, Sect. 1, *Monday* 1-3, Sect. 2, *Monday* 3-5, first term.

Professor Robertson and Dr. Watson.

PHYSICS IV.

This class which is required of students in the second year in Courses E, F, G, consists of (a) one lecture per week throughout the year, (b) a laboratory course of two hours per week, during the second term.

In the lectures, fundamental electrical ideas are discussed, with special emphasis on quantitative relations. Problems are assigned weekly dealing with basic ideas of Electrostatics, Magnetism, Electromagnetism, Electrodynamics, Electromagnetic Induction, and Alternating Currents.

The laboratory course includes a series of experiments designed to train the student in standard electrical measurements, as well as to illustrate work discussed in lectures.

Lectures—Wednesday, 9-10. Professor Robertson.

Laboratory—E, F, G, Sect. 1-2, *Monday* 1-3, Sect. 3-4, *Monday* 3-5, second term.

Professor Robertson, Mr. Conn and Mr. Seright.

PHYSICS V.

Required of third year students in Courses G. and H.

The work of this class comprises a course of lectures on the Elementary, Mathematical Theory of Electricity and Magnetism, and a course of laboratory experiments in advanced electrical measurement.

In the lectures are treated such topics as the more important laws and theories in Electrostatics, the laws of the Magnetic Field, Electrodynamics and Electromagnetic Induction. At each lecture problems are assigned for solution and these are later discussed in class.

In the laboratory the students make detailed study of several groups of experiments. These comprise careful study of galvanometers using both steady and transient currents, measurements of capacities, permeability, insulation resistance, and self and mutual induction, the use of the potentiometer in measurement of electro-motive force of cells, calibration of voltmeters and ammeters, and study of electrical waves and discharge phenomena.

Lecture—Thursday, 9-10, first term.
Monday, 10-11, second term. Professor Flammer.
Laboratory—Wednesday, 1-4.

PHYSICS VI.

Elementary Theoretical Mechanics.

Required of students in third year of Course H.

This course consists of a series of lectures in which the elements of Statics and Dynamics of a Particle are discussed.

Tuesday and Thursday, 10-11, second term.
Laboratory—Tuesday 2-5, second term. Professor Flammer.

PHYSICS VII.

Thermodynamics.

Required of students in third year of Course H.

A course in which the fundamental laws of Thermodynamics, and their application to the Thermodynamical scale of Temperature, to the treatment of saturated Vapours, and to Reversible Processes in general, are discussed.

Tuesday and Thursday, 10-11, first term. Dr. Watson.
Laboratory—Tuesday 2-5, first term. Professor Baker.

PHYSICS VIII.

Electricity.

Required of students in third year of Course H.

The general aim of this course is to acquaint the student with the modern developments in such branches of Physics as Radiation, X-rays, Conduction of Electricity through Gases, Radioactivity, etc.

Text Book—Ions, Electrons and Ionizing Radiations, by J. A. Crowther.
Wednesday and *Friday*, 10-11, second term. Professor Gray.
Laboratory—Thursday 3-5, Second term. Dr. Cave.

PHYSICS IX

Mechanics of Rigid and Elastic Bodies.

Required of students in fourth year of Course H.

This course includes a discussion of such topics as the Motion of a Rigid Body, Ellipsoids of Inertia, Motion with fixed Axis and Fixed Point. Euler's Equations, and applications to motion of the symmetrical top; Stress and Strain relations in Elastic Bodies, Elastic Constants.

Monday, Wednesday and Friday, 11-12, first term. Professor Flammer.

PHYSICS X.

Physical Optics.

Required of students in fourth year of Course H.

A course of lectures on the theory and phenomena of Physical Optics, including a discussion of Wave Motion, Diffraction, Interference Spectroscopes, Polarization and Double Refraction.

Tuesday and Thursday, 11-12, second term. Professor Robertson.

PHYSICS XI.

Electricity.

Required of students in fourth year of Course H.

An advanced course on Electrodynamics and the Conduction of Electricity through Gases.

Monday, Wednesday and Friday, 11-12, second term. Professor Flammer.

PHYSICS XII.

Kinetic Theory of Gases.

Required of fourth year students in Course H.

This course includes the topics of the Maxwellian distribution of velocities, free path phenomena, viscosity, thermal conductivity, diffusion, Van der Waal's equation, and the quantum theory as applied to specific heats and to radiation.

Text Book—Kinetic Theory of Gases—Bloch.

Tuesday, Thursday and Saturday, 11-12, first term. Professor Gray.

PHYSICS XIII.

Required of fourth year students in Course H.

An advanced laboratory course of experiments in Optics, Electricity and Magnetism and Heat.

Monday, Wednesday, Friday, 1-4. Professors Gray and Robertson.

PHYSICS XIV.

Precision Measurements.

Required of third year students in Course B.

A course of laboratory experiments with occasional lectures on precision experiments, involving use of balance, spectroscope and other precision apparatus and accurate measurement of the fundamental quantities of elementary physics.

Friday, 9-11, first term. Professor Flammer.

PHYSICAL LABORATORIES.

The Physics Department is located in the southern half of Ontario Hall, and contains a large lecture room, with a seating capacity of 125, a small lecture room with seating capacity of 60, a small class room, two large rooms equipped as general elementary laboratories, and one room equipped as an electrical laboratory for advanced work, offices for the staff, research rooms, a large, well-lighted library and reading room, smaller rooms for special purposes, apparatus and store rooms. The equipment for lecture table and laboratory is steadily growing and comprises most of the more important pieces of apparatus for these purposes.

Research in Physics is being carried on by members of the staff and by senior students. It is desired to extend this activity as far as possible. A limited number of workers who desire to use the facilities of the laboratory may be admitted and assisted. Particulars may be obtained from the Professor of Physics.

LIBRARY.

The library contains text-books, works of reference, and journals devoted to Physics and related subjects. These may be freely consulted by the student in the reading room between the hours of 8 a.m. and 5 p.m. Books may in general be taken from the building overnight upon reporting to a member of the staff and making a record in a book provided for that purpose. It is only by special permission, however, that any book may be kept longer than one night at a time.

CHEMISTRY.

Professor of Chemistry—Arthur C. Neish, A.M., Ph.D., F.C.I.C.
Professor—L. F. Goodwin, A.C.G.I., Ph.D., F.I.C,
Professor—J. A. McRae, M.A., Ph.D., F.I.C.
Assistant Professor—Grenville B. Frost, B.A., Ph.D.
Assistant Professor—L. A. Munro, M.A., Ph.D., F.C.I.C.
Assistant Professor—Roy L. Dorrance, M.A.
Instructor—M. C. McNab, M.A.
Milton Hersey Fellow—S. A. McNeight, B.Sc.,
Demonstrators—A. C. Plewes, B.Sc.
" F. S. Wilder, B.Sc.
" Percy Moss, B.A.
" G. H. Heintzman.

	First Courses.	Second or Advanced Courses.	Research Training Courses.
General and Inorganic Chemistry	I	II, III, IIIb	IV
Qualitative Analysis	I	———	—
Organic Chemistry	I	II	IV
Quantitative Analysis	I, II	———	IV
Physical Chemistry	I	II, III	IV
Industrial Chemistry	I, II	IIIa	IV
Colloid Chemistry	Ib	———	—
Reports and Essays	—	———	—

General and Inorganic Chemistry

General Chemistry I.

For all first year students in Science.

This course presupposes a mastery of the contents of matriculation chemistry.

In addition to studying in detail the history, methods of preparation, properties and industrial applications of the most important non-metals and metals and their compounds, the fundamental theories, laws and principles are emphasized. Simple unknowns are also given.

Texts—*Kendall, Smith's College Chemistry,* (Century Co.)
Properties and Numerical Relationship of the Common Elements and Compounds—J. E. Belcher and J. C. Colbert. (Century Co.)

Lectures—Monday, Wednesday, Friday at 9, or *Monday and Wednesday* at 2 and *Friday* at 11, in room 310, Gordon Hall.

Laboratory—Sections 5-8, *Tuesday,* 1-4, *Sections* 1-4. *Wednesday* 1-4. in 305, 308, Gordon Hall.

Professor Neish and Assistants.

General Chemistry II.

For students in Courses EFG Second Year.

This lecture course is designed to supplement Chemistry I, including in its scope such chemical principles, facts and theories as will find application in Civil, Mechanical and Electrical Engineering. Some of the topics dealt with are; the chemistry of the metals, fundamental chemical theory, the laws of solutions. homogeneous and heterogeneous equilibria, the colloidal state and simple organic compounds. These topics are illustrated by lecture experiments and problems.

Lectures—Tuesday and Saturday at 9.

Texts—Kendall, *Smith's College Chemistry,* (Century Co.)

Chapin—*"Second Year College Chemistry"* (Wiley & Sons).

Dr. Munro.

Inorganic Chemistry III.—Advanced Inorganic Chemistry.

For students in Course B, third year.

This course will consist of a critical study of General Inorganic Chemistry, especially the general chemistry and analytical behavior of the metals.

Text—Lowry, *Inorganic Chemistry,* (Macmillan & Co.)

Lecture—Monday, 10, *and Thursday,* 11, in room 201, Gordon Hall.

Professor Neish.

General Chemistry IIIb—Advanced General Chemistry.

For students in Course B, fourth year, second term.

The work of this course is mainly devoted to the study of the phase rule and its applications.

Text Book.

Findlay—*The Phase Rule and its Application* (Longman's, Green).

Lectures—Monday and Friday at 11 in room 105, Gordon Hall.

Laboratory—Wednesday, 1-4, second term, in 210 Gordon Hall. Dr. Frost.

General and Inorganic Chemistry IV—Research Training.

For graduate students and students in Course B, fourth year, electing thesis option in General and Inorganic Chemistry.

Professors Neish, Frost and Munro.

Qualitative Analysis

Qualitative Analysis I.—

For students in Courses A, B, C, D, second year.

The lectures deal with the theory of analytical chemistry. The modern concept of the structure of matter is related to analytical behaviour. The development and application of the laws of equilibrium and solutions are emphasized.

The laboratory work consists of the systematic analysis of basic and acid ions leading to the analysis of alloys, salt mixtures, minerals and various commercial products.

Texts, Miller: *Theory of Qualitative Analysis,* (Century Co.).

A. A. Noyes, *Qualitative Chemical Analysis,* 9th *Edition,* (Macmillan Co.)

Reference Texts—Stieglitz, *Qualitative Analysis Vol. I.,* (Century Co.).
Ware, *Essentials of Qualitative Analysis* (Wiley).
Treadwell & Hall, Vol. I. (Century Co.)

Lectures—Thursday at 11, and *Tuesday* 8-9 first term, and *Tuesday* 11-12 second term, rooms 310 and 305, Gordon Hall.

Laboratory—Wednesday 1-3, and *Friday* 1-5, rooms 107-109, Gordon Hall.

Dr. Munro.

Organic Chemistry.

Organic Chemistry I.—General Organic Chemistry.

For students in Courses B and Dc., third year.

An elementary course in general organic chemistry. The properties of some of the more important compounds are studied in the laboratory and a number of them prepared.

Texts—Kipping and Kipping, Perkin and Kipping's *Organic Chemistry,* (W. & R. Chambers.)

Adams and Johnson, *Laboratory Experiments in Organic Chemistry,* MacMillan Co.

Lectures—Wednesday and Friday, at 11 in rooms 310 and 105, Gordon Hall.

Laboratory—B students, *Saturday,* 9-12 in room 213, Gordon Hall.

Dc. students, *Monday,* 9-10, 11-12, first term, and *Wednesday,* 1-5, in the second term.

Professor McRae

Organic Chemistry II.—Advanced Organic Chemistry.

For students in Course B, fourth year.

Advanced systematic organic chemistry including lectures on special topics, such as alkaloids, steroisomerism, terpenes and carbohydrates. The

laboratory work includes both practice in organic qualitative and quantitative analysis, and practice in the preparation of a considerable number of substances illustrating the general methods and reactions of Organic Chemistry.

Texts—Bernthsen—Sudborough, *Organic Chemistry,* (Blackie & Son.)
Cohen, *Practical Organic Chemistry,* (Macmillan Co.)

Books of Reference—Cohen, *Advanced Organic Chemistry,* (Arnold).
Henrich-Johnson. *Theories of Organic Chemistry,* (Wiley & Sons.)

Lectures—Tuesday and Thursday, at 11, in room 105, Gordon Hall.

Laboratory—Wednesday, 1-4, first term; *Friday,* 1-4, second term; *Saturday,* 9-12, in room 213, Gordon Hall.

Professor McRae.

Organic Chemistry IV.—Research Training.

For graduate students and students in Course B, fourth year, electing thesis option in Organic Chemistry. Professor McRae.

Quantitative Analysis.

Quantitative Analysis I.—Short course.

For students in Courses A, C, D, and H, third year.

This is an elementary course designed to illustrate the fundamental procedures of Quantitative Analysis. Gravimetric determinations are made of sulphur, chlorine, iron and phosphorous. A full treatment of volumetric analysis is given including acidimentry and oxidation-reduction methods. The determinations include iron, chromium and manganese in simple ores, iodimetric copper, the analysis of brass, and other similar determinations.

Text—Hall, *Textbook of Quantitative Analysis,* (Wiley).

Lectures—Thursday 1-2, in room 105, Gordon Hall.

Laboratory—Thursday, 2-5, for C. and H; *Friday,* 1-4, for A and D. *Friday,* 8-10, second term for Dc.

Dr. Frost and Mr. McNab.

Quantitative Analysis II.—Full course.

For students in Course B, third year.

This course is designed to give intensive training in the principles of Quantitative Analysis to students majoring in Chemistry. In the class room, students are given practice in the application of the principles of theoretical chemistry to specific analytical problems. In the laboratory typical determinations are made, as much time as possible being devoted to the complete analysis of substances of industrial importance.

Text Book—Hall, *Textbook of Quantitative Analysis,* (Wiley).

Lectures—Monday and Wednesday, at 9, in room 105, Gordon Hall.

Laboratory—Thursday, 2-4, and *Friday,* 1-4; and *Tuesday,* 1-4, first term in 207, 209, Gordon Hall. Dr. Frost and Assistant.

Quantitative Analysis IV.—Research Training.

For graduate students and students in Course B, fourth year, electing thesis option in Quantitative Analysis.

Dr. Frost.

Physical Chemistry.

Physical Chemistry I.

For students in Courses B, C, D, third year.

The principles of Physical Chemistry, and their application to the study of chemical reactions and equilibria. Special attention is given to problems of industrial importance. The laboratory work is designed to acquaint the student with the most important physical chemical measurements and to train him in habits of accuracy, despatch, and in the planning of methods for research.

Text—Millard, *Physical Chemistry for Colleges* (McGraw-Hill).
Lectures—Tuesday and Thursday, at 9, in room 105, Gordon Hall.

Laboratory—Wednesday, 1-4 for B (a), *Tuesday,* 1-4, B (b), and C, in 115, 116 Gordon Hall. Dr. Frost.

Students in courses Dc and Dm. will take physical chemical laboratory in the Chemical Engineering Department, under Dr. L. F. Goodwin.

Tuesday, 1-4, Dc, (sect. 1), Dm (a); *Wednesday,* 1-4, Dm (b); *Saturday,* 9-12, Dc (sect. 2).

Text—Findlay, *Practical Physical Chemistry* (Longmans, Green & Co.)

Physical Chemistry II.—Electrochemistry.

For students in Courses B and D. fourth year.

This course is designed to acquaint the student with the application of electricity to aqueous solutions considering such quantities as the mechanism of electrolysis, transport numbers and ionic migration, solvation of ions, conductance of solutions, modern dissociation theory, reversible cells with and without diffusion, hydrogen electrode, polarization, overvoltage, anodic and cathodic reactions. Some industrial applications such as storage batteries, electrolysis of fused salts, electroplating are discussed. The laboratory work consists in the determination of the quantities discussed in the lectures, electrometric titrations, and the production, electrolytically, of such compounds as ammonium persulphate and white lead.

Prerequisite—Chemistry 1, 2, 21, 35, 41.

Texts—Glasstone, S.—*The Electrochemistry of Solutions,* (Meuthen & Co. Limited).

Findlay, *Practical Physical Chemistry,* (Longmans, Green & Company).

Reference—Thomson, *Theoretical and Applied Electrochemistry* (Macmillan Company)

Blum and Hogaboom, *Principles of Electroplating and Electroforming,* (McGraw-Hill).

Kolthoff and Furman, *Potentiometric Titrations,* (John Wiley).

Allmand—*Applied Electrochemistry,* (Arnold).

Lectures—Monday at 10, *and Tuesday at* 8.

Laboratory—Dm *Wednesday* 1-4; B and Dc *Thursday* 1-4.

Professor Dorrance.

Physical Chemistry III.—Advanced Physical Chemistry.

For students in Course B, fourth year.

This course is designed to give the student an intimate working knowledge of the fundamental principles of Physical Chemistry, and a measure of command in the use of these principles in the solution of chemical problems. A full discussion of thermodynamics is given, including the numerical calculation of free energy and entropy, and a brief treatment of the Nernst Heat Theorem. Reference:

Lewis and Randall, *Thermodynamics and the Free Energy of Chemical Substances.* (McGraw-Hill).

Lectures—Tuesday and Thursday, at 10, in 105 Gordon Hall.

Laboratory—Friday, 1-4, first term in 116 Gordon Hall.

Dr. Frost.

Physical Chemistry IV—Research Training.

For graduate students and students in Course B, fourth year, electing thesis option in Physical Chemistry.

Professors Dorrance and Frost.

Industrial Chemistry.

Industrial Chemistry I.

For students in Courses E, and F, fourth year.

For outline of topics see under Department of Chemical Engineering.

Lecture—Wednesday, at 10, in Department of Chemical Engineering, Ontario Hall.

Professor Goodwin

Industrial Chemistry II.—Long course.

For students in courses B and D, third year.

In the lectures the following topics, illustrated by specimens, lantern slides and motion pictures and visits to plants, will be discussed: Industrial applications of air and water, natural gases, petroleum products, producer gas, water gas, coal gas, by-product coke, sulphur, sulphuric acid (chamber and contact), sulphites, hydrochloric acid, nitric acid and ammonia, nitrates (natural and synthetic), fertilizers, alkalies, mortars, and cements. In the laboratory typical industrial processes as crystallization, precipitation, filtration, distillation and rectifications, incomplete reactions, gas analysis, industrial flow sheets will be carried out and interpreted.

Texts—Rogers, *Manual of Industrial Chemistry,* (Van Nostrand).
Atack, *Chemist's Year Book,* (Westman Press), or
Olsen, *Van Nostrand's Annual* (Van Nostrand).

Lectures—Tuesday and Thursday at 10, B in room 310, Gordon Hall.
D in Ontario Hall.

Laboratory—B, *Monday,* 1-4, in 101, Gordon Hall.

Professor Neish.

Industrial Chemistry IIIa.—Advanced.

For students in Course B, fourth year—first term.

For outline of topics see under Department of Chemical Engineering.

Lectures—Monday and Friday, at 11, first term, in Ontario Hall.

Laboratory—Monday, 1-4, first term, in Ontario Hall.

Professor Goodwin

Industrial Chemistry IV.—Research Training.

For graduate students and students in Course B, fourth year, electing thesis option in Industrial Chemistry.

Professor Neish.

Colloid Ib—Colloid Chemistry.

For students in Course B. fourth year, second term.

An introductory course of three hours per week for the first term, The lectures will deal with the general properties of colloids, surface phenomena, adsorption, special stress being laid upon the practical applications of Colloid Chemistry. The laboratory work is illustrative of the topics dealt with in lectures, and includes the preparation of colloids by different methods and a study of their electrical properties, coagulation, surface tension, viscosity, adsorption, gels etc.

Texts—Hatschek,—*Introduction to Physics and Chemistry of Colloids.*
Holmes—*Laboratory Manual,* (Wiley & Sons).

Reference Texts—Bancroft, *Applied Colloid Chemistry,* (McGraw-Hill Co.)
Alexander: *Colloid Chemistry,* (Chem. Cat. Co.).
Weiser, *Hydrous Oxides,* (McGraw-Hill Co.)

Lectures and Laboratory—Monday 1-4, second term.

Dr. Munro.

Reports and Essays.

In the fourth year of Course B. Reports and Essays will play an important part in the training of a Chemist. A graduate in Chemistry should be able to use the library, as it is one of the most important tools of the profession, and to this end he should be able to read Scientific German and French.

The work will consist of written reports on assigned topics, the equivalent of four hours per week throughout the year.

Professors Dorrance and Munro.

BACTERIOLOGY.

Professor—Guilford B. Reed, M.A., B.Sc., Ph.D.

BACTERIOLOGY XII.

For third year students in Course B.

This course will include a general survey of the nature and behaviour of micro-organisms followed by an experimental study of characteristic bacteriological reactions concerned in industrial processes as alcoholic fermentation, the production of acetone and higher alcohols, vinegar and other acid fermentations, ripening of foods, food decomposition and preservation. Finally a rapid survey will be made of sanitation as applied to water supplies water purification and sewage disposal plants. Laboratory work and prescribed reading.

Texts—Thomas, *Bacteriology.*

Allen, *Industrial Fermentations.*

Lecture and Laboratory—Wednesday, 1-4, second term; Bacteriological Laboratory, New Medical Building. Professor Reed.

GEOLOGY.

Professor—M. B. Baker, B.A., B.Sc., F.G.S.A., F.R.S.C.

Miller Memorial Research Professor—E. L. Bruce, B.Sc., M.A., Ph.D., F.R.S.C.

Associate Professor—B. Rose, B.Sc., Ph.D., F.G.S.A., F.R.S.C.

Assistants—G. M. Furnival, B.Sc.; J. D. Turner, B.Sc.; H. F. Zurbrigg, B.Sc.

Research Assistant—D. F. Burke, B.Sc.

The Geological and Mineralogical Museum, situated on the ground floor of Miller Hall, is equipped with splendid collections of minerals, ores, rocks and fossils, classified and systematically arranged to illustrate most of the subjects treated in lectures. This is a section of the work in which the co-operation of the mining public is invited, and all donations to this museum will be kept and credited to the donor.

The various courses in Geology, described in some detail below, are intended to equip the professional geologist, the mining engineer, the civil engineer requiring a knowledge of the relative merits of natural construction material. The classes are open to Arts students as well as to those of the engineering professions. Graduates or others wishing to investigate a special geological problem will have all possible facilities in the way of laboratories and apparatus at their disposal.

GEOLOGY I

For second year students in courses A, B, C, and D.

ELEMENTARY GEOLOGY. Students taking this class must have passed in Chemistry I.

An introductory course in general Geology is given preparatory for those students who proceed to a more advanced course in Geology or Mining, and at the same time a more or less complete, though elementary course for those who do not pursue the subject any farther.

The following subjects will be treated in the lectures: The Atmosphere; the Hydrosphere; the Lithosphere; the probable nature of the Earth's interior; the general characters and classifications of rocks; volcanic action; earthquakes; upheaval and subsidance; glaciation; the geological effects produced by heat, pressure, water; bosses; dykes; veins; stratification; dip and strike; anticline and syncline; faults; foliation; the nature and uses of fossils; stratigraphical geology, and an outline of the history of the Earth.

During the month of October excursions will be conducted to places of geological interest in the vicinity of Kingston. Students in Geology and Mineralogy are required to take part in these excursions.

Lectures—Tuesday and Thursday, 9-10. Professor M. B. Baker.

Text-book: Miller, *Elements of Geology,* (Van Nostrand Co.).

GEOLOGY II

For third year students in course C.

STRUCTURAL, DYNAMICAL, AND PHYSIOGRAPHICAL GEOLOGY. Before taking this class students must have passed in Geology I.

The principles of gradation, deformation, faulting, mountain formation, and vulcanism are covered in a more general and a more advanced way than in Geology I. Attention is also given to the origin of the Earth; the metamorphic cycle; types of marine and continental sedimentation; an introduction to paleontology, physiography, map reading and interpretation.

Lectures—Monday, Wednesday and Friday, 9-10. Professor Rose.

Text-book: Chamberlin and Salisbury, *Introductory Geology.*

GEOLOGY III.

For students in Courses A and C. third year.

ELEMENTARY PETROGRAPHY. Students must have passed in Geology I, and must take Mineralogy III.

This course is essentially on igneous geology and petrography, and will consist of lectures on the use of the petrographical miscroscope and accessories in the determination of rock forming minerals, and on the determination of some of the more common igneous rocks by both microscopic and field tests. This will be followed by lectures and discussion on the geological occurrences of igneous rocks, the processes of crystalization from magmas, the forms assumed, the textures, and the metamorphic changes that are produced in the mass itself and on its surroundings. The lectures will be supplemented by laboratory work on hand specimens and rock slices.

Lectures—Tuesday, 10-11 and *Friday* 11-12, second term.
Professor M. B. Baker.

Laboratory—Tuesday, 2-4, second term.
Professors Baker, and Rose.

Text-book: Pirsson, *Rocks and Rock Minerals,* (John Wiley & Sons.)

GEOLOGY V.

For fourth year students in Courses A. and C.

Geology of Canada. Before taking this class, students must have passed in Geology I. and III.

In this course special attention will be given to Pre-Cambrian Geology, and the distribution of the various rock formations in Canada. The topography as well as the structural make-up of the Dominion is studied.

Lecture—Thursday, 2-3, second term. Professor Bruce.

GEOLOGY VI

For fourth year students in Course C.

Historical Geology. After a brief study of the various types of sedimentary formations and the principles of paleogeography, the history of the North American continent is taken up with supplementary references to the other continents when desirable. Emphasis is laid on Canadian occurrences. A number of the more important fossils of each period are studied, and their recognition on sight required. Brief consideration is also given to the history of the Science of Geology.

Lectures—Tuesday and Thursday, 9-10. Professor Rose.

Text-book—Pirsson and Schuchert, *Text-book of Geology Part II.* (Historical), (John Wiley & Sons.)

GEOLOGY VII.

For fourth year students in Course C.

ADVANCED PETROGRAPHY. A course of lectures will be given on the microscopic characters and classification of igneous rocks, and on their general field characters, origin and classification. The lecture work will be supplemented by assigned special reading and by laboratory work with both hand specimens and microscopic slides. Special attention will also be paid to the metamorphic rocks.

Laboratory—Monday, 2-4. Professor Baker.

GEOLOGY VIII

For fourth year students in Courses A. and C.

ECONOMIC GEOLOGY. This class treats of the principles of ore deposition. For this purpose type deposits in the largest producing districts throughout the world are studied in some detail. It is, of course, impossible to treat of all products, but the basis of classification and the fundamental principles underlying economic deposits are studied with particular reference to iron, copper, nickel, zinc, lead, silver, gold, aluminum, peat, coal, gas, oil, salt, abrasive and refractory materials. A few lectures on building stones as well as on clays and the manufacture of clay products will be given.

Lectures—Monday, 10-11; *Tuesday,* 11-12; *Thursday,* 10-11 (b).
Professor Baker.

GEOLOGY IX

For third year students in Course E.

ENGINEERING GEOLOGY. This course is intended for students in Civil Engineering, and after a brief introduction to geology will treat of the occurrence, composition, texture, structure and alterations of rocks, with special reference to their effects on the workability or removal of the rocks in excavation, and in the selection of raw material in construction work. There will also be lectures on clay-products and the selection of building materials, and an outline of the manufacture of bricks, fire-proof blocks, terra-cotta, roofing-tile, sewer-pipe, and drainage-tile, will be given. Physiography and drainage will also be studied, and a brief discussion of the principles of economic geology.

Lectures—Wednesday and Thursday, 11-12. Professor Baker.

Text-book—Ries & Watson, *Elements of Engineering Geology,* (John Wiley & Sons.)

GEOLOGY X

For students in Course C.

FIELD AND LABORATORY GEOLOGY. The laboratory exercises in this course are designed to illustrate by means of specimens, models, photo-

graphs, maps and sections, the principal original and secondary structures of rock; the origin and mode of occurrence of rocks in the earth's crust, their cycles of alteration and change; their interpretation and representation in geological surveys.

The field work comprises observations upon the weathering of rocks; shore phenomena; glacial phenomena; igneous and sedimentary rocks; faulting; folds; joints; cleavage; schistosity. Practice in methods of surveying and geological mapping and construction of sections; measuring the thickness of strata and determining the relative ages of geological structures, and the preparation of a map to scale.

Two working hours per week will be arranged to suit the class at the beginning of the first term.

Field Work—Monday, 1-4.

Professor Rose.

GRADUATE COURSES

For graduates in Courses A and C.

GEOLOGY XIII.

Principles of Pre-Cambrian Geology. The origin, history and distribution of the rocks older than the Cambrian. Special attention will be given to the Canadian Pre-Cambrian areas. The course will be given in alternate years. It will be offered in 1932-33.

Lectures—Wednesday and Friday at 9.

Reading and Laboratory Work—Wednesday, 1-4.

Prof. Bruce.

GEOLOGY XIV.

Metamorphic Geology. The processes of rock weathering, consolidation of sediments, formation of gneisses and strata, and the wall rock alterations produced by veins are studied in detail. The course will be offered in alternate years. It will be offered in 1932-33.

Lectures—Tuesday and Thursday at 9.

Reading and Laboratory—Thursday, 1-4.

Prof. Bruce.

GEOLOGY XV.

Pre-Cambrian Ore Deposits. Discussion of ore deposits in Pre-Cambrian rocks with especial reference to those in Canada. The genesis and character of the deposits will be studied in detail. It will not be offered 1932-33.

Lectures—Wednesday and Friday, 9.

Reading and Laboratory Work—Thursday 1-4.

Prof. Bruce.

Excursions to accessible localities are required.

Seminar—A Seminar for students in graduate courses meets two evenings each month. It is voluntary and no registration is required.

MINERALOGY.

PROFESSOR—J. E. HAWLEY, M.A., Ph.D., F.G.S.A.

ASSISTANTS—N. D. RUNNALLS, M.A.; C. S. LONGLEY, B.A.; D. K. Burke, B.Sc.

The work in this department is intended for students taking the courses in (1) Mining and Metallurgical Engineering, (2) Chemistry, (3) Mineralogy and Geology, and (4) Chemical and Metallurgical Engineering.

It consists of six undergraduate sections, viz.: Mineralogy I., II., III., IV. V. and VI.

Students in Course A take section I. in the second year and section III. and IV. in the third year.

Students in Course C take section I. in the second year, sections II., III., and IV. in the third year, sections V. and VI. in the third or fourth year.

Students in Courses B and D, take section I. in the second year.

MINERALOGY I

For Second year students in Courses A, B, C, D.

ELEMENTARY MINERALOGY. The work in this class is intended as a preparation for those entering upon the studies of geology, petrography, mining and metallurgy . The class should be taken in the second session, after the Chemistry and Physics of the first session, as a knowledge of Chemistry and Physics is necessary for a proper comprehension of the subject. The regular work consists of (1) a course of lectures and demonstrations on crystallography, (2) illustrated lectures on the physical, optical and other properties of minerals, (3) the description of about one hundred important rock and ore minerals, (4) practical work in the determination of these by means of the blowpipe and field tests, (5) excursions during October and November for field work. Students are urged to make use of the museum, and of the study room provided for them in the Mineralogical department.

Each student is supplied for the session with a locked cabinet containing a collection of minerals for which he is held responsible. A practical examination requiring the identification of minerals in hand specimens must be passed by each student before credit in this course will be given. The practical work of the class is conducted in the mineralogical and blowpipe laboratory, where cabinets containing specimens of commonly occurring minerals are arranged for use. Students are taught to recognize minerals by simple field tests, such as form, color, streak, hardness, specific gravity, etc. For this work students must provide themselves with a pocket-lens, knife, and magnet.

Saturday Excursions.

Lecture—Tuesday, 10. Professor Hawley.

Blowpipe Class—Section 2, *Monday,* 1-3, *Section* 1, *Monday,* 3-5.

Text-books: For Courses A, and C, Ford, *Dana's Text-book of Mineralogy* (Wiley and Sons, 1922). 3rd Edition.

For Courses B and D:
Ford, *Dana's Manual of Mineralogy,* 14th Edition, 1929.

Books of Reference:

Crosby, *Tables for the Determination of Minerals.*
Eakle, *Tables.*

Moses & Parsons, *Mineralogy, Crystallography and Blowpipe Analysis,* 5th Ed.

Brush & Penfield, *Manual of Determinative Mineralogy and Blowpipe Analysis,* 17th Ed., 1912 (Wiley & Sons).

MINERALOGY II.

Systematic Mineralogy. For students in Course C. Third year.

The work consists of a course of lectures, dealing with crystallography, crystal measurements and drawing, and a more advanced study of the physical and optical properties of minerals. Microscopic methods of identifying the feldspars are an important part of this course.

Lectures—Monday and Friday, 10-11; 2nd term. Professor Hawley.

Text-books—Dana, *Text-book of Mineralogy,* 1922. (Wiley & Sons).

Books of Reference:

Winchell, *Elements of Optical Mineralogy,* Part II.
Miers, *Mineralogy.*
Tschermak, *Mineralogie.*
Bragg, *X-ray and Crystal Structure,* 4th Ed.

MINERALOGY III

For students in Courses A, and C, Third year, first term.

Optical Mineralogy. The work of this class is intended for those students only who are taking Course A, Mining Engineering, and Course C, Mineralogy and Geology. It is preparatory to the classes of petrography and determinative mineralogy, which should be taken during the session following. The lectures treat of light and the optical properties of minerals. The laboratory work is designed to give the student practical training in the microscopic identification of the common rock forming minerals.

Lectures—Thursday, 10-11, *Friday,* 8-9, first term. Professor Hawley.
Laboratory—A—Tuesday 1-3—*C—Friday* 1-3, 1st term.

Text-book: Dana, *Text-book of Mineralogy,* 1922. (Wiley & Sons), or *Elements of Optical Mineralogy* (Part I.), A. N. Winchell, 3rd Ed., (Wiley & Sons), 1928.

MINERALOGY IV

For students in Courses A, and C. Third year.

DESCRIPTIVE AND DETERMINATIVE MINERALOGY. The work of this class consists in the exhibition and description of the mineral specimens contained in the several museum collections, special attention being given to ores, gangue-minerals, those having a commercial value and those of importance as rock-forming minerals. By field tests and the use of the blow-pipe practice is obtained in the determination of minerals. A short course in the microscopic determination of opaque minerals is included. Cabinets furnished with specimens of minerals from various parts of the world are supplied for students' use. The number of specimens is being constantly increased by collection, donation, exchange and purchase, the aim being to make the collection as complete as possible.

Lecture—Wednesday 1-2. *Laboratory, Wednesday,* 2-4.

Professor Hawley and Mr. Longley.

Text-book: Dana, *Text-book of Mineralogy,* 1922. (Wiley & Sons).

MINERALOGY V

For students in Course C, Third year

ADVANCED DESCRIPTIVE AND DETERMINATIVE MINERALOGY. This is a lecture and laboratory class dealing in more detail with the metallic ore minerals, their occurrence and associations and with mineral alterations connected with such deposits. It is intended for students specializing in Mineralogy and Geology. This class will alternate with Mineralogy VI. It will not be given in the session 1932-1933.

Lecture—Wednesday and *Friday* at 11, first term; *Wednesday* at 11, *Friday* at 8, second term. Professor Hawley.

MINERALOGY VI

For students in Course C, Fourth year.

MINERAL TECHNOLOGY. A course of lectures, illustrated by specimens and lantern slides, supplemented by demonstrations in the museum showing the occurrence and industrial uses of minerals and mineral products.

The following mineral products will be treated: Abrasives, Refractories, Glazes, Ceramic Ware, Lime, Cement, Plaster, Fertilizers, Pigments, Insulators, Gems, Building Stones, etc.

This class will be given in alternate years with Mineralogy V. It will be offered in the session 1932-1933.

Lecture—Wednesday and *Friday* at 11, first term; *Wednesday* at 11, *Friday* at 8, second term. Professor Hawley.

Books of Reference:

Publications of the Geological Survey of Canada.
Publications of the Mines Branch, Department of Mines, Canada.
Publications of the United States Geological Survey.

Research and Thesis—Students wishing to undertake the research work and thesis of the fourth year under the Department of Mineralogy should consult with the instructors not later than the beginning of their fourth year with regard to research subjects and hours.

GRADUATE COURSES

For graduates in Courses A and C.

MINERALOGY CXV.

ADVANCED OPTICAL MINERALOGY—A course designed to give students further training in the determination of optical properties of minerals. Special study will be made of igneous and metamorphic minerals, and of the heavy residuals of sedimentary rocks. This class will be given in alternate years with Mineralogy XVI. Given during session 1932-1933.

Lectures and Laboratory—6 hours a week, to be arranged.

Professor Hawley.

MINERALOGY CXVI.

(a) ADVANCED CRYSTALLOGRAPHY:
Crystal Measurement and Crystal Drawing.

(b) ADVANCED MINERALOGRAPHY:
Microscopic determination of opaque ore minerals.
Mineral suites from different mining localities will be studied.

Text—Determination of the Opaque Minerals—C. M. Farnham, 1st Ed. (McGraw Hill, 1931).

This course alternates with Mineralogy XV. Not offered in session 1932-33.

Lectures—Monday and Wednesday at 8.

Laboratory—Monday 9-11.

Professor Hawley.

MINING ENGINEERING.

PROFESSOR—S. N. Graham, B.Sc.

MINING I.

For students in Course A, third year.

PROSPECTING. Methods used in prospecting for lode, placer and coal mines. Location, laws, and requirements of mineral prospects and their examination.

Development of Prospects. The early workings of mines, with a consideration of the many factors entering into the proving up of mineral bodies as commercial quantities.

Boring. The use of long distance drills for prospecting, and for reaching fluids. The rotary Diamond drill, and the percussion drills; their fields of operation and relative merits.

Excavation. The tools and machines used in breaking and removing rock. Also hand and power drilling to place explosive. The common mining explosives; their uses and operation.

Mining Methods. A consideration of the main factors in developing a mine. The sinking of shafts; driving of tunnels, etc. The stoping or winning of minerals from the vein or ore body.

Lectures—Wednesday, 11-12; *Tuesday*, 9-10, second term.

Laboratory—Tuesday, 9-10. first term.

Professor Graham.

Books of Reference:

Hoover, *Principles of Mining.*

Peele, *Mining Engineers' Handbook.*

Mining II.

For students in Course A, fourth year.

Placer Mining. Consideration of alluvial deposits and their origin: placer mining proper, hydraulic placer, and gold dredging.

Supports. Various forms of timbering or supporting a mine's passages, and stope excavations. The timbers used. Costs and alternative methods; causes of decay in timbers and their preservation. The use of iron and masonry.

Transportation. The handling of material underground, by chutes, cars, and hoists; rope and locomotive haulage. Surface transportation by road, rope, and railway. Loading, unloading, and terminal arrangements.

Hoisting. Head frames, ropes, and drums; various systems which balance the load to some extent or give a steady load on the engines.: Hoisting of ore. Safety appliances and signalling.

Drainage. Sources of water, drainage by tunnels; hoisting of water; use of pumps, and principal types for light and heavy work. Bulkheads.

Ventilating. Natural and artificial conditions which demand ventilation. Methods of ventilating metal and coal mines. Gases of a coal mine. Fans, and distribution of air in coal mines.

Lighting. Use and place of candles, lamps, and safety lamps.

Mine Examination and Valuation.

Students' Papers. These are hour and half hour talks upon observations from experience in the field.

Lectures—*Tuesday* 1-2; *Wednesday,* 10-11; *Thursday,* 10-11, first term and *Tuesday,* 10-11, second term, and *Wednesday,* 8-9, first term.

Professor Graham.

Books of Reference:

Peele, *Mining Engineers' Handbook.*
Hoove, *Principles of Mining.*
Young, *Elements of Mining.*
Finlay, *Cost of Mining.*
Storms, *Timbering and Mining.*
McGarraugh, *Mine Book-keeping.*

Geophysical Prospecting.

Included in the work of this class is a special course in geophysical prospecting, giving special attention to magnetic and electrical methods.

Lecture—Monday, 11-12. For students in courses A and C, fourth year.

Mining III.

For students in Course A, fourth year.

The first term work includes practice and problems in Mine Surveying, also the reduction and plotting of a mine survey

In the second term these hours are given to furnace and metallurgical work and to any subject suitable to the course, as a subject for designing, for example, the designing of mill, smelter, surface plant of a mine.

Monday and Wednesday, 1-4; Professors MacKay and Graham.

Mining IV.

For students in Courses C and Dm. fourth year.

This is a course of lectures briefly discussing the formation of ore-bodies, their development and exploitation, the machinery and equipment required, and the sampling and valuation of mining properties. It is intended to link up the work of the geologist and metallurgist with the mine.

Lectures—Monday 1-2; and *Wednesday* 8-9; first term.

Professor Graham.

Summer Essay.

For students in Course A, fourth year.

In order to encourage close observation, and the faculty of expressing by text and illustration, the student during his summer vacations is expected to gather material for an essay of from two to three thousand words.

The essay must cover the result of personal observation and be on some subject relating to mining, milling, metallurgy or geology.

The subject title must be given before the end of October. and the essay handed in before the end of the first term. Essays requiring revision must be returned before the spring examinations begin.

All essays must be type-written and suitably bound.

Ore Dressing.

For students in Courses A, C. Dm., third year; Dc., fourth year.

These lectures follow the sequence of operations on an ore from the time it reaches the mill until it leaves as a concentrate or bullion. The principles and practice of rock crushing, ball milling, classification and concentration on jigs and tables are fully discussed. Particular attention is paid to the concentration of ores by flotation. Other accessory processes such as magnetic concentration are taken up and the flow sheets of different mills are studied.

Lectures—Thursday, 11-12; and *Wednesday* 8-9, second term.

Professor Graham.

Books of references: Taggart—*Handbook of Ore Dressing.*
Truscott, *Ore Dressing.*

Milling.

For students in Course A and Dm. fourth year.

Ores of the more common metals are investigated in the laboratories to determine suitable methods of concentration of or recovery of their metals by milling. Groups of two or three students are given an ore to investigate. Examination of the ore is first carried through by use of the microscope, by screen analyses, etc. Based on the information thus gained, a course of treatment on a sample of the ore is carried through. Each student takes part in the investigation and treatment of as many ores of the precious metals, and also of those of base metals as time will permit.

Laboratory—Friday, 8-4, A. Dm; *Saturday,* 9-12, A

Professors MacKay and Graham.

Ore Dressing Laboratories

These are equipped for the testing of ores in small lots from various mining districts.

The equipment consists of a 7 x 10 Blake crusher, rolls and fine grinders. There is a complete equipment of modern small, or minature machines for testing ores and illustrating principles and processes of treatment. These consist of small ball and pebble mills, various types of screens and classifiers, jigs, Wilfley tables, several types of small flotation machines and magnetic concentrators.

The Metallurgical Laboratories

The Metallurgical laboratories proper contain a blast furnace and a large roasting furnace, each served by a bag house; a Monarch oil furnace and a gas furnace for obtaining temperatures up to 1400°C; a Hoskins electric furnace for temperatures up to 1700°C; three electric arc furnaces; a vacuum electric furnace; two tubular electric furnaces; a Hump furnace; an electric muffle furnace; a recording potentiometer; thermocouple and optical pyrometers; and calorimeters.

The Fire Assaying laboratory contains seven gas muffle furnaces of different sizes, a three-muffle crude oil furnace, and four gasoline crucible furnaces.

The Metallography laboratory is equipped with a complete cutting and grinding plant; a disc polishing machine; microscopes, with complete optical equipment; a vertical micrograph outfit, and the necessary dark room and equipment; and well selected sets of specimens.

Two well appointed chemical laboratories, a balance room and a room for electrolytic assaying complete the laboratory equipment of the Department.

METALLURGY.

Professor—G. J. MacKay, B.Sc.

Assistant Professor—O. A. Carson, B.Sc., Ph.D.

Metallurgy I.

For students in Courses E, F, G, third year.

A brief discussion of the physical properties and uses of the common metals. The more important industrial alloys, their composition, properties and uses. Refractory materials. The properties of iron and steel, the effects of impurities and of methods of manufacture and working, and the heat treatment of steel.

Lecture—Tuesday, 10-11. Professor MacKay.

Text-book—Rosenholtz, Elements of Ferrous Metallurgy.

Metallurgy II

For students in Courses A, B, C, Dm., third year and for Course Dc, fourth year.

Heat, calorimetry and pyrometry. Solid, liquid, and gaseous fuels and the special metallurgical uses of each kind. An introduction to general metallurgy—principles, operations and appliances. The metallurgy of iron and steel.

Lectures—Monday, 11-12; *Wednesday*, 10-11. Professor MacKay.

Text-book—Rosenholtz, *Elements of Ferrous Metallurgy.*

Austin, *Metallurgy of the Common Metals.*

Metallurgy III

For students in Course Dm. third year.

Metallurgical calculations based on the work covered in Metallurgy II.—heat, calorimentry, and pyrometry; heat balance, iron blast furnace charges, etc.

Lecture—Friday, 11-12, second term Professor MacKay.

Metallurgy IV.

For students in Courses A, Dm. fourth year.

The metallurgy of the more common non-ferrous metals—gold, silver, copper, lead, and zinc. The extraction of these metals from their ores, the refining of the metals, their uses, and the alloys into which they enter.

A consideration of the ordinary methods of recovering nickel, cobalt, tin, arsenic, antimony, etc., from the ores.

Lectures—Tuesday, 9-10; *Wednesday*, 11-12; *Thursday*, 11-12.
Professor MacKay.

Text-book—Austin, *Metallurgy of the Common Metals.*

Metallurgy V.

For students in Course Dm. fourth year.

Metallurgical calculations related to the work covered in Metallurgy IV. Discussions of metallurgical subjects by the students and the reading and discussion of students' essays.

Lectures—Tuesday, 11-12, first term; *Thursday*, 10-11, second term.
Professor MacKay.

Metallurgy VI.

For students in Courses Dm, G. fourth year.

Electro-metallurgy; introductory course in electro-chemistry followed by

the consideration of the electrolytic refining of copper, gold and silver and the electrical smelting of aluminum and iron ores, etc.

Lecture—Wednesday, 8-9, second term. Dr. Carson.

Metallurgy vii.

For students in Course Dm. fourth year.

Metallurgical plant design. The calculation of the capacities of units in a plant—agitators, sumps, pipes, launders, pumps, furnaces, converters, etc. Details of equipment. Flow sheets. General layout of plants. Bills of material. Power requirements.

The work will consist largely of individual problems for the library and drafting room.

Laboratory—Tuesday, 1-3. Professor MacKay.

Metallurgy viii.

For students in Course F, fourth year.

Laboratory course dealing with the heat treatment of steel.

Laboratory—Friday, 8-10, first term. Dr. Carson.

Metallography.

For students in Course Dm. fourth year.

Introductory course in metallography, including:

(*a*) Explanation and interpretation of equilibrium diagrams.

(*b*) Constitution and structure of some industrial alloys, with special reference to brasses, bronzes, bearing metals and different grades of steel.

Lecture and laboratory work—Monday, 11-12; *Saturday,* 9-12. Dr. Carson

Metallurgical Laboratory.

For students in Course Dm. fourth year.

Laboratory course dealing with a number of metallurgical operations The following experiments are made by the students attending this course: Determination of calorific power and impurities in coals, standardization of pyrometers by various methods, determinations of cooling curves, decomposition of sulphates and reduction of oxides, heat treatment of steel.

Electroplating, operation of the blast-furnace and electric furnace.

Laboratory—Thursday, 1-4, Dm. Dr. Carson.

Summer Essay.

Required of students in Course Dm. fourth year.

In order to encourage close observation, and the faculty of expressing by text and illustration, the student during his summer vacations is expected to gather material for an essay of from two to three thousand words.

The subject title must be given in by October 15th of the final year, and the essay handed in before the end of the first term of the final year. Essays requiring revision must be returned before the spring examinations begin.

The material on which the essay is based must be information gained at first hand in metallurgical or chemical plants or laboratories or in mills during the equivalent of, at least, one complete summer vacation.

Fire Assaying.

For students in Courses A, Dm., third year and Course C, fourth year.

The Laboratory course in fire assaying consists of:

(*a*) A number of experiments to test the action of the different reagents used and slags made in assaying.

(*b*) The determination of lead by fire assay methods.

(*c*) The determination of gold and silver in silicious, oxidized and sulphide ores and mattes.

(*d*) The assay of gold and silver bullion.

Lecture—Tuesday, 1-2, *Laboratory,* 2-5, second term, Dm. *Saturday,* 8-9, *Laboratory,* 9-12, second term, A and C . Professor MacKay.

CHEMICAL ENGINEERING.

Professor—L. F. Goodwin, A.C.G.I., Ph.D., F.I.C.

Assistant—Stuart McVeigh, B.Sc.

All lectures and laboratory work in Ontario Hall.

Industrial Chemistry I.

For students in courses E, and F, fourth year.

A lecture course developed for students in Mining, Mechanical and Civil Engineering. Topics such as the rusting of iron and its preservation, water for steam raising and domestic use, paints, lubricants, explosives, pyroxylins and cements are discussed, mainly from the engineer's point of view.

Texts—Leighou, *Chemistry of Materials,* (McGraw-Hill Co.)

Bulletins of the U.S. Bureau of Mines, and other pamphlets.

Lecture—Wednesday, at 10, in Ontario Hall.

Professor Goodwin.

Industrial Chemistry II.—Long course.

For students in courses Dc, and Dm, third year.

For outline of topics, see under Department of Chemistry.

Texts—Thorp, *Industrial Chemistry*, (The MacMillan Co.)
T. M. Lowry, *Inorganic Chemistry*, (The MacMillan Co.).

Lectures—Tuesday and Thursday, at 10, *Ontario Hall.*

Laboratory—Dc, Sect. 1, *Saturday*, 9-12, Sect. 2, *Tuesday*, 1-4. Dm, *Saturday*, 9-12.

Professor Goodwin and Mc. McVeigh.

Industrial Chemistry IIIa.—Advanced.

For students in Course B. fourth year—first term.

This course deals with the following subjects:—Distillation and dephlegmation, wood distillation, alcohol, acetic acid, acetone. Dissolution, decantation, filtration, centrifugals. Manufacture of organic nitro compounds and explosives. Equilibrium and optimum conditions for contact sulphuric acid and synthetic ammonia processes, absorption of gases by liquids and solids, absorption and reaction towers, electric furnace products and synthetic acetone. potash manufacture and recovery, recovery of waste acide, films, sulphite, sulphate and mechanical wood pulp, paper.

Texts—Partington, *The Alkali Industry.*
Assigned Reading.

Lectures—Monday and Friday, at 11, in Ontario Hall.

Laboratory—Monday, 1-4.

Professor Goodwin

Chemical Engineering i.

For students in Course Dc. third year.

A preparatory course in plant design; stoichiometrical calculations, and problems in Applied Physical Chemistry

Text—Hitchcock and Robinson, *"Differential Equations in Applied Chemistry,* (John Wiley and Sons).
Handbook of Chemistry and Physics. Hodgman-Lange.

Lecture and Laboratory—Tuesday and Thursday at 11, second term.
Professor Goodwin.

Chemical Engineering ii.

For students in Course Dc. fourth year.

Industrial Processes.—The subjects dealt with comprise: distillation and dephlegmation, wood distillation, alcohol, acetic acid, acetone. Plant for nitric acid manufacture. Influence of heats of reaction: examples distillation of nitric acid and acetone. Atmospheric nitric acid, synthetic ammonia, sulphuric acid, a study of the equilibria and optimum conditions involved in their manufacture. Dissolution, decantation, filtration, centrifugals

The moving of gases, liquids and solids. The measurement of gases, and their absorption by liquids and solids. Absorption and reaction towers and their design. Filling materials and the considerations governing their action and efficiency. The manufacture of nitro compounds, the concentration of weak acids and the recovery of waste acids.

Pulp, Paper and Synthetic Plastics—Absorption principles and sulphite towers. The manufacture of mechanical and sulphite wood pulp. The Kraft or Sulphate, and the soda process, modern methods of causticising, washing, and of lime, soda and heat recovery. The elements of paper manufacture. The manufacture of gun-cotton, cordite, nitro-cellulose powder, celluloid, viscose or artificial silk, and of other synthetic colloids.

A collection of industrial products and apparatus is available for demonstration, and visits are paid to outside chemical works in the final year, at which attendance is required.

Designing of Chemical Plant. Calculations and exercises in designing chemical apparatus and factories. Considerations underlying the choice of materials of construction, acid proof containers and cements. The design of a nitric acid plant and the evolution of structural details. Manufacturing costs as dependent o nthe cost of plant, raw materials, labour, etc.

Lectures—Wednesday and Friday, 11 a.m.
Laboratory—Wednesday, 1-4.

Professor Goodwin

Texts.—Partington, *The Alkali Industry.*
Badger & MacCabe, *Elements of Chemical Engineering.*

Assigned Reading from:
Davies, *Handbook of Chemical Engineering.*
Lunge, *Sulphuric Acid and Alkali.*
And Original Publications.

Chemical Engineering iii.

Laboratory Work and Drawing.

A detailed study of apparatus and chemical engineering plant, based on the chemical and physical conditions underlying the various processes. The elaboration in the laboratory of the best working conditions for a given chemical process.

The designing and drawing of parts of a chemical plant, based on experimental results worked out in the laboratory. Experimental work with semi-plant scale chemical engineering apparatus.

The practical work will be divided between the laboratory and the draughting room as is found necessary.

Lecture—Tuesday, 3-4 first term, *Thursday,* 10 second term.
Laboratory—Monday 1-5, *Friday* 9-11.

Professor Goodwin and Mr. McVeigh.

Texts: *Handbook of Chemistry and Physics; or, Chemiker Kalender.*

Assigned reading from:

Davies, *Handbook of Chemical Engineering.*
Lunge-Cummings, *Sulphuric Acid and Alkali,*
And published papers and pamphlets.

LABORATORY OF CHEMICAL ENGINEERING.

The laboratory is provided with large size models of steam-jacketed evaporating pans, porcelain lined and fitted with stirring gear, with a steam-jacketed rectifying column and still, a steam jacketed vacuum evaporator, pump and condenser, a jacketed vacuum shelf dryer, a high pressure acid proof filter, a Sweetland self-dumping filter press with sludge tank and centrifugal pump, a model stream-line filter. several types of vacuum filters, an ordinary and a high speed centrifuge, a rotating high pressure autoclave, and with other technical apparatus.

There is further installed a large reaction tower of earthenware designed for experiments in recovering smelter and other fumes or gases, connected to a fan, and measuring devices, and provided with a liquor circulating system and motor driven pump, and with selected types of earthenware filling material.

Instruction in this laboratory is planned to train the student to handle fairly large quantities of material and to become familiar with standard types of technical chemical apparatus, to work out the experimental methods required for attacking a manufacturing problem, and to translate the laboratory results obtained into practice.

CIVIL ENGINEERING.

PROFESSOR—A. Macphail, B.Sc., LL.D.
PROFESSOR—W. P. Wilgar, B.Sc.
PROFESSOR—W. L. Malcolm, M.A., B.Sc.
PROFESSOR—D. S. Ellis, M.A., B.Sc.
LECTURER—R. A. Low, B.Sc.
DEMONSTRATOR—A. Farquharson, B.Sc.

GENERAL ENGINEERING I.

For students in all Courses second year.

This subject embraces the physical properties of materials used in the different branches of engineering and the principles involved in the theory of beams, columns, and structures.

MATERIALS OF CONSTRUCTION—Resistance and elasticity of materials; stresses in brick, cement, mortar, and concrete; physical properties of the metals and alloys used in engineering, and effects of impurities in them; testing for tensile, compressive and transverse strength.

GRAPHICAL STATICS. Graphical representation of stress; funicular and force polygons; dead and wind loads; graphical methods of determining centres of gravity, shear and bending moments.

MECHANICS OF MATERIALS.—Resistance and elasticity of materials; stress and strain diagrams; bending and shearing forces; compound stress; deflection of beams; columns and struts; riveted joints; centres of gravity and moments of inertia.

Lectures—Monday and Friday, 10-11.

Professor Macphail.

Text-books—Wolfe, *Graphical Analysis*
Merriman, *Mechanics of Materials.*

Books of Reference:

Merriman, *Strength of Materials.*
Thurston, *Materials of Construction.*
Merriman and Jacoby, *Roofs and Bridges, Part II.*
Slocum & Hancock, *Strength of Materials.*

GENERAL ENGINEERING II

For students in Course E, third year.

GRAPHICAL STATICS. Graphical determination of stresses in roof trusses, bridges, cranes, earth-works,retaining walls, dams, arches, arched ribs cantilever and suspension bridges.

MECHANICS OF MATERIALS. Analysis of restrained and continuous beams and columns; torsion of shafts; combined stress; flexure of beams and theorem of three moments; influence lines; reinforced concrete; plate and lattice girders and columns; resilience and fatigue of materials; initial and temperature stresses; earthworks, retaining walls and dams; arches and arched ribs; suspension bridges.

THEORY OF STRUCTURES. Girders, roofs and bridges; selection of types with reference to span, loading, head-room, cost, and other considerations; relative advantages of riveted and pin connections; wind bracing and stiffening trusses; trestles and towers.

Lecture—Wednesday, 10-11; *Thursday,* 10-11.

Professor Macphail.

Text-books—Malcolm, *Graphic Statics.*
Merriman, *Mechanics of Materials.*

Books of Reference—
Slocum & Hancock, *Strength of Materials.*
Bovey, *Theory of Structures.*
Merriman and Jacoby, *Roofs and Bridges, Parts, I., II., III.*

GENERAL ENGINEERING III.

For students in Courses, A, D, E, F, G, third year.

This course consists of practical work in the mechanical and testing laboratories. Its object is to give the student a knowledge of the practical application of the fundamental principles of engineering in general.

Routine tests of cement, lime, mortar, brick, stone, timber, iron, steel, etc. Specific gravity, fineness, tensile and compressive strength of cement, etc.

Measurement of mechanical power by means of indicators, dynamometers, etc. Simple experiments in thermodynamic laboratory.

Laboratory—Monday, 1-3, for A, E, and G. (Sect. 1) students.
Monday, 3-5, for D, F, and G, (Sect. 2) students.
Professors Macphail, Ellis, Arkley and Rutledge.

GENERAL ENGINEERING IV.

For students in Course E, fourth year.

Independent work in the testing laboratories.

Laboratory—Saturday, 10-12, first term.
Professor Macphail and Professor Ellis.

GENERAL ENGINEERING V.

For students in Courses A, D, F, G, third year.

A combined course of lectures, and designing covering the same subjects as in General Engineering II.

Lecture—Wednesday, 9-10; *draughting Thursday,* 2-4 for A and D students, *Friday,* 2-4 for F and G students.

Professor Macphail.

Text-books—Same as for General Engineering II.

GENERAL ENGINEERING VI.

For students in Course E, third year.

GRAPHICAL REPRESENTATION. Representation of engineering formulae and data. Progress and cost diagrams, interpretation of diagrams, solution of problems by means of diagrams.

GRAPHICAL STATICS. Continuation of work in General Engineering II., with relation to roofs, bridges, arches and other structures. Practical work in draughting room.

Lecture—Wednesday, 8-9.

Draughting—Friday, 1-4. Professor Malcolm.

Text-book—Wolfe, *Graphical Analysis.*

STRUCTURAL ENGINEERING I.

For students in Course E, third year.

The work of this class comprises lectures and draughting room work in design of buildings.

In the draughting room students are required to design and detail roofs and other parts of buildings, treating wood and steel as their materials of construction.

Lecture—Friday, 11-12.

Draughting—Thursday, 1-4. Professor Wilgar.

Text-book—*Steel Handbook.*

Books of Reference—Ketchum, *Structural Engineers Hand Book.*
Hool and Kinne, *Structural Members and Connections; Steel and Timber Structures.*

STRUCTURAL ENGINEERING II.

For students in Course E, fourth year.

Design of reinforced concrete structures. Foundations of bridges, buildings and other structures, cofferdams, caissons, substructure types and designs.

Lectures—Monday, 1-2; *Thursday,* 11-12, first term; *Tuesday* 10-11, *Thursday,* 11-12, second term

Draughting—Monday, 1-3, *Friday,* 1-4. Professor Wilgar.

Text-books—Sutherland and Clifford, *Reinforced Concrete Design.*

Books of Reference—
Jacoby and Davis, *Foundations of Bridges and Buildings.*
Hool and Johnson, *Concrete Engineer's Handbook.*

STRUCTURAL ENGINEERING III.

For students in Course Dc, fourth year.

DESIGN OF STRUCTURES. Simple roofs in wood and steel. Foundations. Reinforced concrete. Design of structures essential for Chemical Engineers.

Draughting—Tuesday, 1-3.

Professor Macphail.

Books of Reference—Jacoby, *Framed Structures.*
Ketchum, *Structural Engineer's Handbook.*
Hool & Johnson, *Concrete Engineer's Handbook.*

STRUCTURAL ENGINEERING IV.

For students in Course E, fourth year.

DESIGN OF STRUCTURES. Lectures comprise the design of details in steel bridge trusses and other structures.

Projects will be given to the class in Bridge Design according to Standard Specifications, usually consisting of riveted truss, pin-connected truss, etc. Complete stress sheets, working drawings, estimates, etc., being required.

Lecture—Tuesday, 9-10.
Draughting—Wednesday, 1-4; *Friday,* 10-12.

Professor Macphail.

Text-books—Ketchum, *Structural Engineer's Handbook; Steel Handbook.*

Books of Reference—Merriman and Jacoby, *Roofs and Bridges, Pts. I.-IV.*
Waddell, *Bridge Engineering.*

HYDRAULIC ENGINEERING I.

For students in courses E. F. G. third year, and A, D, fourth year.

Application of hydrostatic pressure in the case of dams, gates and pipes. Flow of water and measurement of its volume by various orifices and weirs. Flow in open channels, ditches, flumes, etc., and the use and application of these conductors of waters. Flow through tubes and pipes. Use of pipes as conductors of supply for domestic and power purposes. Dynamic and static pressure as applied to motors for power purposes. The study of various water wheels, turbines, etc.

Experiments to cover above principles,

Lectures—Thursday, 8-9 and 10-11 (a), *Tuesday,* 10-11 (b) A.D.; *Tuesday,* 8-10, E.F.G.

Text-book—King & Wisler, *"Hydraulics."* E.F.G. Professor Ellis.
Schoder & Dawson, *"Hydraulics."* A.D.

HYDRAULIC ENGINEERING II

For students in E, F, and G, fourth year.

Comprises the study of hydrology, design and construction of dams and appendages; measurement, development and transmission of water-power; design of hydraulic power plants.

Problems and laboratory work in relation to these subjects.

Lecture—Friday, 8-10, E.G., *Monday,* 11-12 and *Thursday,* 9-10. F.

Professor Ellis

Text-book—*Hydroelectric Hand Book,* by Creager and Justin.
"Hyrdaulics" by Angus.

HYDRAULIC ENGINEERING III

For students in Courses E and G, fourth year.

Work in Hydraulic Laboratory or selected experiments dealing with, hydrostatic pressure, orifice, and weir flow, flow through pipes and open channels, loss in valves and pipe fittings, efficiency tests on centrifugal pumps, and reaction and impulse turbine. Investigation of flow in draft tube, Special studies as opportunity offers.

Laboratory—Saturday, 9-11, G, first term; E, second term.

Professor Ellis

RAILWAY ENGINEERING I

For students in Course E, third year.

The work of this class comprises the study of economics of railway location; estimation of traffic; effects of distance, rise and fall and curvature on costs of operation.

The paper location of a railway; economic selection of alternative routes; turnouts; crossings; Mass diagrams; overhaul; estimation of costs of construction.

Lectures—Monday, 9-10, first term; *Thursday,* 9-10.

Field Work and Draughting—Wednesday, 1-4.

Text-book—Webb, *Railroad Construction.*

Professor Wilgar

RAILWAY ENGINEERING II

For students in Course E, fourth year.

A course in Railway Construction and Operation. The preparation of a contractors tender for grading, track laying, ballasting, etc. Railway organization for operation, maintenance of way and structures; yards, terminals and signalling.

Lecture—Tuesday, 11-12.

Draughting—Tuesday, 1-4.

Books of Reference—Gillette, *Cost Data;* Webb, *Railroad Construction;* Orrock: *Railroad Structures and Estimates.*

Professor Wilgar.

ENGINEERING ECONOMICS.

For students in Course E, fourth year.

Valuation of public utilities, depreciation, amortization, government control of public utilities as exemplied by the Railway Act. Engineering contracts and Specifications. Economic selection of structures and plant.

Students will undertake periodical lectures on any chosen subject in this course.

Lecture—Thursday, 10-11. Professor Wilgar.

Text-book: Gillette and Dana, *Construction Cost Keeping and Management.*

Books of Reference—Mead, *Contracts, Specifications and Engineering Relations.*

MUNICIPAL ENGINEERING I.

For students in Course E, third year.

Discussion of Municipal Problems.

Monday, 9-10 and *Friday* 9-10; second term.

Professor Malcolm.

MUNICIPAL ENGINEERING II.

For students in Course E, fourth year.

Water Supply. Municipal water supply. Rainfall. Source of supply. Quantity, quality and purification of water. Distribution, designing and details of construction. Domestic systems.

Monday, 10-11 and *Wednesday,* 11-12; second term.

Professor Malcolm.

Text-book—Turneaure and Russell, *Public Water Supplies.*

MUNICIPAL ENGINEERING III.

For students in Course E, fourth year.

The Collection and Disposal of Sewage and Refuse.

Sewage. The various systems for the collection and removal of sewage. Design. Consideration of rainfall, run off, and water consumption. Proportioning of size. Grades and flow in sewers. Methods of construction and materials used. Plumbing. Maintenance of sewer systems, including ventilation, flushing, and inspection.

Sewage Disposal. Methods employed, Design, construction, and maintenance of the various systems.

Refuse Disposal. Kinds of refuse. Methods of collection and disposal and economic value of same. Incinerators.

Lecture—Monday, 11-12. Professor Malcolm.

Laboratory—Thursday 1-4, second term.

Text Book—Metcalfe and Eddy—Sewerage and Sewage Treatment.

Book of Reference—Metcalfe & Eddy, *American Sewerage Practise Vols. I. II and III.*
Babbit, *Sewerage and Sewage Treatment.*

NOTE

Work in Municipal Engineering II. and III and Highway Engineering has been arranged for one period of three hours per week, *Thursday,* 1-4. Projects in water works, sewer designs, etc., are set and completed during these hours. As far as possible each student will be given separate problems. A time limit is set on each problem.

HIGHWAY ENGINEERING.

For students in Fourth Year, Course E.

Country and city roads and pavements. Lay out, grades, and roadbeds. Various kinds of pavements and methods of construction. Cost and durability. Gutters, curbs, and gullies. Various kinds of walks, methods of construction, materials used. Method of dust prevention. Construction with street railway track. Methods of assessment. Conduit systems, and lighting of streets.

Projects in highway work are set under actual conditions for survey design and estimate.

Electric Railways. Trackwork, including construction in paving.

Lecture—Monday, 10-11; *Wednesday,* 11-12, first term.
Professor Malcolm.

Laboratory—Thursday 1-4, first term.

Text-book—Agg, *Construction of Roads and Pavements.*

Books of Reference—*American Highway Engineers Handbook.*
Blanchard and Drowne, *Highway Construction.*

SURVEYING.

All branches of Surveying receive full consideration. During the outdoor instruction students are given every opportunity to become familiar with the instruments. Notes of all field work are plotted in the draughting-

room, and the rules and regulations for field work and instruments-room must be strictly adhered to. Students must be engaged in the work of a class in the hours set apart for it, otherwise their attendance will not be counted. Attendance and character of work done will be considered in the class standing.

SURVEYING I.

Required of all first year students.

The description, use, adjustment and care of chains, tapes, compasses, levels, transits and minor surveying equipment. Methods employed in elementary surveying.

The practical work in the field and draughting rooms is an important part of this course.

Lecture—(*Field Work*), *Sects.* 1, 2, *Friday,* 1-3.*Sects.* 3, 4, *Monday,* 1-3.
Lecture—(*Field Work*), *Sects.* 5-6, *Friday* 8-10, *Sects.* 7-8, *Monday,* 8-10,
Mr. Low, Mr. Farquharson.

Text Book—Davis, Foote and Rayner; *Surveying.*

SURVEYING II.

For students in Courses E, F, G, second year.

It continues the work of Surveying I., and includes Route Surveying—profiles, vertical curves, elements of switchwork: Topographic Surveying—with stadia, plane table, hand level, and transit and level; Reconnaissance and simple triangulation; Hydrographic Surveying—Methods, sextant, river surveying, stream flow; Laying out of buildings and engineering construction. Underground Surveying. Observations.

Lecture—Tuesday, 11-12.

Field Work and Draughting—Sections 1-2, *Wednesday,* 1-4, *Sections,* 3-4, *Tuesday,* 1-4.

Professor Malcolm, Mr. Low, Mr. Farquharson.

SURVEYING III.

For students in Courses A, B, C, and D, second year.

It will continue the work of Surveying I. Brief courses in the following Profile and vertical curves. (2) Topographic Surveying — Stadia, plane table, hand-level. (3) Hydrographic Surveying—Sextant, soundings, stream flow. (4) Reconnaisance—Simple Triangulation. (5) Earthwork. (6) Layout of engineering structures. (7) Underground Surveying. (8) Observations.

Lectures—Thursday, 10-11.

Field Work and Draughting—Section 1, *Thursday,* 1-4, *Section* 2, *Wednesday.* 8-11.

Professor Malcolm, Mr. Low, Mr. Farquharson.

SURVEYING IV.

For students in Course E, third year.

Topographic Surveying, Stream Measurement, Hydrographic Surveying, Mine Surveying, Base Line Measurement, Triangulations, Adjustment of simple figures, Computation of coordinates, Map Projections; Precise levelling; Observations for Azimuth, Latitude, Time. Introduction to adjustment of observations. Outlines of D.L.S. and O.L.S. systems. Descriptions.

PRACTICE. Field work in stadia survey, triangulations, mine surveying, levelling, observations.

Lecture—Wednesday, 9-10.

Field Work and Draughting—Tuesday, 1-4. Professor Ellis.

Text-book—Davis, Foote and Rayner.

SURVEYING V.

For students in Courses A and C, third year.

Dominion Land Surveying, comprising the methods adopted in Survey of Dominion Lands as laid down in Manual of Survey, issued 1918 by the Dominion Government. Determination of Latitude, Azimuth and Time.

Ontario Land Surveying.

Underground Surveying. Principles involved in Mine Surveys and problems connected with underground work.

Topographic Surveying—Extension of work taken in Surveying III.

Lecture—Tuesday, 10-11, first term.

Field Work—Saturday, 9-12. first term only.

Professor Malcolm, Mr. Low

Text-book—Johnston and Smith, ***Surveying.***

Books of Reference—Surveys Act, Ontario.
Manual of Survey, D.L.S.

ELECTRICAL ENGINEERING.

PROFESSOR—D. M. Jemmett, M.A., B.Sc.

ASSISTANT PROFESSOR—S. C. Morgan, B.Sc., M.Sc.

LECTURER—H. H. Stewart, B.Sc.

DEMONSTRATOR—W. C. Little, B.Sc.

ASSISTANTS—F. C. Lawson, H. S. Pollock. D. R. Ross.

ELECTRICAL ENGINEERING I.

FUNDAMENTAL PRINCIPLES.

For third year students in Courses A, D, E.

The electric circuit. The magnetic circuit. Generated and induced electro-motive forces. Self and mutual induction. Elementary theory of alternating and direct current generators and motors. Common systems of transmission and distribution of electric current. General principles of illumination. Storage batteries.

Lectures—Monday, 8-9, first term; 10-11, second term; *Friday,* 10-11.

Laboratory—D, *Monday,* 1-3; A, E, *Monday,* 3-5.

Mr. Stewart and Mr. Little.

ELECTRICAL ENGINEERING II.

For third year students in Courses G and H.

Alternating currents. Laws governing the flow of current in circuits containing resistance, inductance and condensance. The use of the complex quantity. The theory, construction and operation of the transformer. Meters and the measurement of electrical quantities.

Lectures—Thursday, 11-12; *Saturday,* 9-10.

Laboratory—Saturday, 10-12. Professor Morgan and Mr. Little.

ELECTRICAL ENGINEERING III.

For third year students in Course G.

The electric and magnetic circuits, hysteresis and hysteresis loss. Measurement of magnetic quantities. Some simple transients. Theory of direct current generators and motors. Series, shunt and compound machines. Energy losses, efficiency and commutation, methods of control, Storage batteries. Application of direct current in commercial work. Illumination and photometry.

Lectures—Monday, 9-10; *Wednesday,* 11-12; *Thursday,* 10-11.

Prof. Morgan.

Laboratory—Tuesday, 1-4. Prof. Jemmett and Mr. Little.

ELECTRICAL ENGINEERING IV.

A special course for third year students in Course F.

Lectures—Monday, 8-9, (*a*); 10-11, (*b*); *Friday* 11-12 (*a*); *Wednesday,* 11-12 (*b*).

Laboratory—Monday 1-3. Professor Morgan.

ELECTRICAL ENGINEERING V.

For fourth year students in Course G.

Theory of alternating current generators, Synchronous and Asynchronous Motors. Rotary Converters. Potential Regulators. Phase changing. Multiphase Systems. Transmission of power. Applications of alternating current in commercial work.

Lectures—Monday, 11-12; *Wednesday,* 11-12; *Thursday,* 10-11; *Friday,* 11-12. Professor Jemmett.

Laboratory—Thursday, 1-4; *Friday,* 1-4.
Prof. Jemmett and Mr. Little.

ELECTRICAL ENGINEERING VII.

A special course for fourth year students in Course F.

Lecture—Wednesday, 1-2, Prof. Morgan.

Laboratory—Wednesday, 2-4, Prof. Morgan and Mr. Little.

ELECTRICAL ENGINEERING VIII.

For Fourth year students in Courses G. and H.

Exact solution of transmission lines in the steady state. The general differential equation. Solution in hyperbolic functions. Free, grounded and loaded lines. Nominal and Equivalent $\overline{\Pi}$ and T lines. Use of complex circular and hyperbolic tables and charts. Solution of power and telephone lines.

Lecture—Tuesday, 9-10.

Laboratory—Tuesday, 1-4. Professor Jemmett.

ELECTRICAL ENGINEERING IX.

For Fourth year students in Course G.

Advantages and Disadvantages of Electric Traction. Electric Motors available for Traction Work. Motor Cars and Electric Locomotives. Methods of Control. Comparison of Characteristics of Steam and Electric Locomotives. Power required for various classes of service. Brakes and Braking. Transmission and Distribution of Power for Traction Purposes.

Lectures—To be arranged.

Laboratory—Monday, 1-4. Professor Jemmett.

ELECTRICAL ENGINEERING X.

For fourth year students in Course G.

Design and Calculation of performance of transformers, generators, and motors.

Lecture—Tuesday 10-11.

Draughting Room—Monday, 1-4, Mr. Stewart.

ELECTRICAL ENGINEERING XI.

For fourth year students in Course G.

The Morse System. Repeaters. Duplex and Multiplex Systems. Combination Systems. Automatic and Printing Telegraph. Railway Block Systems. Modern Telephone Systems. Wireless Telegraphy and Telephony. Simultaneous Telegraphy and Telephony.

Lecture—To be arranged.

Laboratory—Monday, 1-4. Professor Morgan.

ELECTRICAL ENGINEERING XII

Required of Fourth year students in Courses G and H.

A Course on fundamental principles of Thermonics with special reference to electron tubes. Applications of electron tubes to radio, carrier current telephony, and power uses are considered and discussed.

Lectures—Wednesday, 10-11; *Thursday,* 9-10.

Laboratory—Saturday 9-12; second term.

Prof. Morgan and Mr. Stewart.

Electrical Engineering Laboratories.

Laboratories Nos. 1, 3, and 4 are equipped with standard types of direct and alternating current machines which include synchronous motors and generators, rotary converters, polyphase induction motors, repulsion and compensated induction motors, constant current transformers, series and potential transformers, power transformers, direct current shunt, series and compound wound machines. A complete set of rheostats and brakes with all necessary meters are available for determining the performance of these machines.

Laboratory No. 4, is also equipped with two high voltage D.C. generators, giving potentials up to 3000 volts, a 500 cycle inductor alternator and a high current low voltage generator giving current up to 800 amperes for calibration purposes.

Laboratory No. 5 is fitted with a photometer and standard lamps. A Duddell oscillograph is available for the determination of wave forms and transient phenomena. This laboratory also has a complete equipment of standard precision instruments for making all exact electrical measurements.

Laboratory No. 6 contains the experimental transmitting station C.F.R.C. There is also a receiving set of very flexible design. This laboratory in addition to being a Radio laboratory is used for the study of the characteristics of electron tubes as generators oscillators and amplifiers. A number of tubes with the necessary variable condensers, reactors, A and B batteries, and wavemeter are available. Direct current up to 3000 volts and 0.40 amperes is provided for plate voltages..

Laboratory No. 2, contains the storage battery and balancer set control panels and a transformer giving voltages up to 100,000 volts. A sphere gap and pan type electrostatic voltmeter are available for measuring high voltages and a number of insulators suitable for testing are on hand.

Power is available from the University Plant at 220/110 volts D.C. direct or through a motor—generator set which delivers power at 120/60 volts D.C. and 2 phase 85 volts 25 cycles A.C. A 125 volt, 200 ampere hour storage battery and city power at 3 phase 220/110 volts 60 cycles are also provided.

A large number of circuits which have terminals in the various laboratories enable power to be easily transferred from any machine to any other machine.

The University Power Plant is a combination direct and alternating current system making available for study and observation such apparatus as D.C. generators, synchronous motors, Tirril regulators, balancer sets, storage batteries, power transformers, watthour meters, boosters, switchboard apparatus, etc.

The city of Kingston has a new and up to date hydro-electric station, to which visits are made for instruction and observation.

MECHANICAL ENGINEERING.

Professor—L. M. Arkley, M.Sc.

Associate Professor—L. T. Rutledge, B.A., Sc.

MECHANICAL ENGINEERING I.

Elements of Machine Design.

For students in Courses F, and G, third year; Course D, third year, first term.

The work in this class comprises a study of the following:— Characteristics of materials used in machine construction; a review of the principles of simple stress and bending moments, their application to beams, columns and machine fixtures; principles governing design, selection of working stresses; horizontal and vertical shear and compound stress; distribution of stress in machine parts; analysis of stress and design of fixtures; for example, rivetted connections, bolts, nuts, screws, keys, cotters and pins; analysis of stress in simple shafting, crank shafts on two bearings; shaft couplings; miscellaneous problems of design, i.e. design of wall brackets, bases and frames for machinery; bearings; graphical solutions applicable in design, i.e. Mohr's Method of determining the position of the Centre of

Gravity and Moment of Inertia of a complex section; study of manufacturing and machine processes as applied to the manufacture of machinery.

Lectures—Tuesday, 11-12; *Wednesday,* 8-9. Professor Rutledge.

Text-books—*Principles of Machine Design,* by Norman; Marks, *Mechanical Engineer's Handbook.*

MECHANICAL ENGINEERING II.

Transmission of Power in Machinery.

For students in Courses F, and G, third year.

The work in this class consists of analyses of stress and design of power transmission systems, comprising belt, rope, chain and gear drives; study of couplings, friction clutches and brakes.

Lectures—Monday, 11-12 and *Friday,* 11-12; second term only.
Professor Rutledge.

Text-book—*Principles of Machine Design,* by Norman; Mark, *Mechanical Handbook.*

MECHANICAL ENGINEERING III.

Practical Machine Design.

For students in courses F and D, third year.

This course is a practical application of work taken up in Mechanical Engineering I. and II., which courses are prerequisites of the course Mechanical III.

Draughting—Wednesday, 1-4, F; *Thursday,* 1-4, F; *Wednesday,* 1-4, D, first term. Professor Rutledge.
and Demonstrator.

Principles of Machine Design, by Norman.

MECHANICAL ENGINEERING IV.

The Elements of the Power Plant.

For students in Course F, third year and students in Courses A, D and E, fourth year.

This course covers the following:—Fuels and combustion; transfer of heat; heating surface; generation of steam; types of boilers; chimneys; artificial draft; smoke prevention; mechanical stoking; coal handling; use of superheated steam; feedwater heaters; condensing systems; pumping machinery; compressed air; gas and oil engines; gas producers and heating systems.

Lectures—Thursday, 9-10, A, D, E, F;
Wednesday, 11-12,F, (a); *Tuesday,* 10-11, A. D. E. (a).
Professor Arkley.

MECHANICAL ENGINEERING V.

Advanced Machine Design.

For students in Course F, fourth year.

This course consists of a more rigorous treatment of the elements of Machine Design and a more intensive study of simple and compound stress.

The effect of curvature of stress lines is studied and applied to the design of curved beams, crane hooks, punch press frames; the study of stress in crank shafts is continued and applied to multiple cylinder crank shafts with more than two bearings.

The following subjects are treated fully:—Eccentric loading in various forms; the forces acting on moving parts in machinery including frictional forces involving the study of kinetics; analysis of stress in automobile parts and in machine tools; analysis of stress in a member which does not consist of one homogenous material; design of helical, spiral and leaf springs; lubrication and lubricating oils; bearings of all types; flywheels; interaction of motor and flywheel in a flywheel drive.

Jigs, dies, cams and fixtures design. This part of the course treats of the fundamental principles of tool design and the application of the principles; heat treatment of steel from a mechanical engineering standpoint.

Lectures—Tuesday 10-11, *Wednesday,* 11-12, *Thursday,* 11-12.

Professor Rutledge.

Laboratory—Monday, 1-4, *Tuesday,* 1-4.

Text books—Reference Books in Mechanical Library and Technical Journals.

MECHANICAL ENGINEERING VI.

DESIGN OF POWER PLANTS, HEATING, VENTILATING AND REFRIGERATION.

For students in Course F, fourth year.

This course deals with the following:—The proportioning and selection of elements and their combination in steam power plants to obtain the maximum profit from investment and operation. Theoretical and practical principles governing the design and operation of gas producer plants. Power plant testing methods and apparatus.

Heat losses from buildings; design of hot air, hot water and steam heating systems. Discussion of refrigeration systems.

Lectures—Thursday, 10-11 and *Tuesday,* 9-10, first term.

Professor Arkley.

Text-books—Reference books in Library, Hoffmann, *Heating and Ventilating.*

MECHANICAL ENGINEERING VII.

PRACTICAL MACHINE DESIGN.

For students in Course G, third year.

This course is a practical application of work taken up in Mechanical I and II which courses are pre-requisites of the course.

Draughting—Thursday, 1-4. Professor Rutledge.

MECHANICAL ENGINEERING VIII.

Fuel Testing.

For students in Course F, fourth year.

This course covers the following:—

Testing of fuels, gaseous, liquid and solid, with respect of their suitability for power generation. Gas and fuel analysis. Calculation and calorimetric determination of the heating value of fuels. Gas analysis in connection with the operation of steam boilers, gas and gas producers. Physical tests of lubricants. Causes and prevention of boiler scale. Treatment of feed-waters.

Laboratory—Saturday, 9-12, second term.

Professor Arkley and Demonstrator.

MECHANICAL ENGINEERING IX.

Kinematics of Machinery.

For students in Courses E, F, and G, second year.

This course treats of the theory of mechanisms with special attention to the following: The nature of a machine; uniform and variable motions in machines; velocity diagrams, motion diagrams using the phorograph method; applications to various mechanisms found in engines, locomotives and machinery.

The design of gears and cams are treated from first principles including development and design of tooth profiles for cycloidal involute and stub teeth; simple, compound and epicyclic gear trains and proportioning of speeds in machine tools.

Lecture—Tuesday, 9-10.

Draughting—Section 1, *Thursday,* 1-3. Section 2, *Friday,* 1-3.

Professor Rutledge and Demonstrator.

Text-book—Angus, *Theory of Machines.*

MECHANICAL ENGINEERING XI.

Internal Combustion Engines.

For students in Course F, fourth year.

This course consists of the design of gas, gasoline and oil engines, suitable for use in automobiles, tractors and stationery engines.

Lecture—Tuesday, 9-10, and *Friday,* 9-10, second term only.

Text-book—Streeter, *Internal Combustion Engine.*

Professor Arkley.

THERMODYNAMICS I.

ELEMENTARY THERMODYNAMICS.

For students in Courses A, D, E, F, and G, third year.

The course consists of a study of the following;—Fundamental laws of Thermodynamics; specific heats; special changes of state, i.e., constant volume, constant pressure, isothermal, adiabotic, polytropic; ideal cycles with perfect gases. Carnot, Stirling and Ericsson cycles; air compression, work and temperatures, maximum economy of compression; thermal properties of saturated vapors and of vapor and liquid mixtures; properties of steam; use of steam tables; miscellaneous type problems on the above.

Lectures—Monday, 10-11, *Friday,* 9-10; first term. Professor Rutledge.

THERMODYNAMICS II.

MECHANICS OF MACHINERY.

For students in Courses F, and G, third year.

This course furnishes a treatment of the following;—Crank effort and turning moments in steam engines; governors; speed fluctuation in machinery; kinetic energy of machines, including effects of inertia; proper weight of fly wheels; accelerations in machinery and their effects; forces in machines and efficiency of members; graphical constructions; disturbing forces; stresses due to inertia; balancing of machinery.

Lecture—Friday, 9-10, second term.

Text-book—Angus, *Theory of Machines.*

Professor Rutledge.

THERMODYNAMICS III.

ADVANCED THERMODYNAMICS.

For students in Courses Dc, F, and G, fourth year.

This course treats of the following:—Theory of refrigerating machines and systems. Entropy and entropy-temperature diagrams. Superheated steam. Performance of actual engines. Influence of size, speed, valve gear and ratio of expansion on economy. Steam jackets, Compound and triple expansion engines. Advanced theory of gas and oil engines. Action of steam upon turbine buckets. Flow of steam through nozzles, orifices, and turbine passages, Effects of friction on flow. Types of steam turbines, and their operation.

Lectures—Monday, 8-9, *Tuesday,* 11-12.

Laboratory—Dc, F, *Saturday,* 9-12, first term; G, *Wednesday,* 1-4, first term.

Professor Arkley.

Experiments in Thermodynamic Laboratory and local power plants.

THERMODYNAMICS IV.

ADVANCED THERMODYNAMIC LABORATORY WORK.

For students in Course, F, fourth year.

This course consists of advanced engine and power plant testing.

Laboratory—Friday, 10-12, 1-4.

Professor Arkley and Demonstrator.

THERMODYNAMICS V.

VALVE AND VALVE GEARS.

For students in Course, F, third year.

This course consists of a study of the design and action of slide, coreless, piston and poppet valves, etc., valve diagrams; fixed and reversible gears, valve governors, valve operating cams and eccentrics. The lecture work is carried on in conjunction with draughting room exercises and practical valve setting on laboratory apparatus.

Lecture—Friday, 10-11 (*b*), *Saturday,* 11-12 (*a*).

Laboratory—Tuesday, 1-3.

Professor Arkley and Demonstrator.

THERMODYNAMICS LABORATORY.

Thermodynamics Laboratories are now divided into two sections, first the Internal Combustion Engine laboratory in Fleming Hall and second, the steam laboratory located at the New Central Heating Plant. The equipment of the former includes a producer gas engine unit complete, a four stroke cycle oil engine, a two stroke cycle gasoline engine, several gasoline engines of different types, and a semi-Diesel Hoag engine and several aeroplane engines.

The steam laboratory proper containing a number of types of steam engine, an air compressor, a condenser and pump, injector testing equipment, etc.

The work in this laboratory is given in connection with the Central Heating Plant where the auxiliary equipment such as steam turbines, centrifugal and reciprocating pumps, water tube and fire tube boilers and feed-water heaters are all available for study and investigation by the students, they having been designed with this object in view.

A valuable feature in connection with this plant is the study of different methods of heating as carried out from one Central Plant. The whole plant is conveniently equipped for making overal efficiency tests under practical working conditions.

The boilers are equipped with superheaters which makes investigations on the important question of superheated steam possible.

SHOP WORK

INSTRUCTORS—A. C. Baiden, Machine Shop.
W. E. Connolly, Blacksmith Shop.

For students in Courses E, F, and G, second year; Course F, third year; Course Dc., fourth year.

Students in courses F and G shall enter any commercial works approved by the School and take a special course of shop training extending over a period of thirty-six weeks (18 weeks between second and third, and 18 weeks between third and fourth college years; or, in case accommodation cannot be secured, they shall attend a special course in the workshops of the School, extending over a period of 8 weeks (4 weeks preceding their third college year and 4 weeks preceding their fourth college year).

A student in Course H. shall enter any commercial works approved by the school and take a special course of shop training extending over a period of 12 weeks, between the second and third years of his course.

To ensure that as many students as possible will have an opportunity to obtain their shop training in commercial works, arrangements have been made with the management of several of the large manufacturing establishments, so that the students who have completed their second year, may enter upon a suitable course of shop training and receive such remuneration as will more than cover their expenses. In this case the student must present a certificate from the manager of the works in which he has carried out his practical work, stating the character of the work done and the amount of time spent in the various departments.

The student must present the certificate to the Professor of Mechanical Engineering who has general supervision over all shop work.

A complete forge shop has been added to the equipment, so that now efficient instruction can be given in machine shop practice, and in blacksmithing. The forge shop is located in the basement of the workshop building, and is equipped with the latest type of downdraft forges, and electric drive for the blower and exhauster.

In connection with the work in blacksmithing a short course is now given in cutting and welding by the Oxy-Acetylene process. Five welding tables and one cutting bench have been installed and completely equipped with the most modern torches and other apparatus supplied by the Dominion Oxygen Company.

Students in all courses will be given a course of practical work in workshops of the School as per schedule of courses.

Work Shop—Second year, E, F, and G. Section 1, *Tuesday,* 1-3.
Section 2, *Tuesday,* 3-5, Section 3, *Wednesday,* 1-3, Section 4, *Wednesday,* 3-5.
Third Year, F, *Saturday,* 8-11 (*a*), 9-12 (*b*).
Fourth year, Dc. *Friday,* 1-4, second term.

DRAWING.

Associate Professor—A. Jackson, B.Sc.

Assistants—R. W. Stevens, B.Sc.; D. Jack, B.Sc.

All drawings are to be drawn in the drafting room assigned. Drawings made by the students are considered the property of the department, and must not be taken from the drafting room until the close of the spring session.

DRAWING I.

For all first year students.

The lectures and practical work are arranged with the view of preparing the student for the subject of Engineering Drawing.

Each student at the opening of the term must provide himself with a set of drawing instruments of approved standard.

The class standing will be determined by the term's work.

The work will consist of (*a*) Free-hand lettering adapted to working drawings; (*b*) Geometrical drawing and simple working drawings, tracing and blue printing.

Sections 1-2, *Tuesday,* 9-12, *Thursday,* 8-10.

Sections 3-4, *Tuesday,* 9-12, *Friday,* 1-3.

Sections 5-6, *Wednesday,* 9-12, *Thursday,* 1-3.

Sections 7-8, *Monday,* 10-12, *Wednesday,* 9-12.

Professor Jackson

Text-book—French, *Manual of Engineering Drawing.*

DRAWING II.

For students in Courses A, B, C, and D, second year.

The work will include structural and machine drawing, assembly drawings, detail drawings from free-hand sketches of details of machines, developed surfaces and intersections, tracing and blue-printing.

The class standing is determined by the term's work.

Wednesday, 3-5, and *Saturday,* 9-12; second term. Professor Jackson.

Text-book—French, *Manual of Engineering Drawing.*

DRAWING III.

For students in Courses, E, F, and G, second year.

A more extended course than as outlined in Drawing II.

The class standing is determined by the term's work.

Thursday, 3-5, first term; *Thursday,* 9-12, second term.

Sections 1-2, *Monday,* 3-5, second term.
Sections 3-4, *Monday,* 1-3, second term.

Text-book—French, *Manual of Engineering Drawing.*

PROJECTION.

For first year students in all courses.

A course in the principles of Orthographic, Axonometric and Isometric Projections applying Descriptive Geometry to the representation of the more familiar rectilinear and curvilinear solids, in sections and intersections and the development of their surfaces.

Division of space into four quadrants. Projection of a point in the four quadrants. Representation of infinite planes. Projections of lines on auxiliary planes. Intersection of planes. Traces of lines and planes. Rotation of points and planes about a fixed axis. True length of a line. Inclination of a plane to the horizontal and vertical planes of projection.

Sections 1-2, *Thursday,* 10-12.

Sections 3-4, *Monday,* 3-5.

Sections 5-6, *Thursday,* 3-5.

Sections 7-8, *Friday,* 9-11.

Professor Jackson

DESCRIPTIVE GEOMETRY.

Required of all second year students.

A continuation of the latter part of the course in Projection. Shortest distance of a point to a line, angle between intersecting lines and planes. Projection of a solid figure on any oblique plane. Intersection of a line and a plane. Perpendicular to a plane. Shortest distance between two lines not in the same plane. Angle between line and plane. Application of Projection principles to the solution of problems in guide pulleys. Shadows thrown by lines, planes and solids. Shades and shadows of cones, pyramids, etc., on one or more planes. Perspective representation of points, lines and solids.

The students are drilled in the subject by numerous applications in the drafting room.

A. B. C. D., *Wednesday,* 3-5, and *Saturday,* 9-12. first term,

Professor Jackson

E. F. G., *Monday,* 1-3, and *Thursday,* 9-12, first term.

Text-book—Smith, *Practical Descriptive Geometry.*

PHYSICAL TRAINING.

PHYSICAL DIRECTOR—James G. Bews.
MEDICAL ADVISOR—H. S. Angrove, M.D.

Each first year student is given a physical examination by the Medical Adviser and corrective exercises in the gymnasium are prescribed when they are needed.

Gymnasium work for two hours each week is required of all first year students except those excused by the Medical Adviser. Voluntary classes are offered other students. The physical drill consists of progressive series of exercises with dumb bells, Indian clubs, bar bells, and chest weights, combined with marching tactics and free setting-up exercises; also apparatus work on long horse, parallel bars. ladder and horizontal bar.

A wide option is allowed and equivalent credit is given for attendance at gymnastic classes or during active membership on the football, hockey, basketball, or track teams, and in the fencing wrestling and boxing clubs, of the University. Credit is also given to those electing to take C.O.T.C. training in place of regular gymnastic work.

The new gymnasium, opened January 1st, 1931, is one of the finest in Canada.

HOSPITAL PRIVILEGES

By regulation of the Senate all students who register in the University must pay a fee of $4.00 towards a health insurance fund which is used by the University to provide medical care for those who are ill. This charge is included in the sessional fees. Details of this plan will be available at Registration.

ATHLETICS

As a member of the Canadian Intercollegiate Amateur Athletic Association Queen's gives every opportunity for students to compete in intercollegiate athletics on some of the many teams representing the University, while the student who is not a good enough athlete to find a place on a University team has the chance to play in inter-year and inter-faculty games.

All athletic activities are controlled by the Athletic Board of Control, consisting of twelve members—four graduates, four Professors, and four undergraduates. Two of the Professors and the four undergraduate members are elected by the student body. This Board controls the rink, the playing fields, and the gymnasium, and has a supervision and power of veto over the management and expenditure of the rugby, soccer, hockey, basketball, tennis, track, swimming, boxing, fencing, and wrestling clubs.

Through the generosity of Mr. James Richardson, of Kingston and Winnipeg, a graduate in Arts of the University, a new stadium was completed during the summer of 1921. It is situated on the Union Street Campus and is known as the George Richardson Memorial Field. The grand-stand is of steel and concrete construction, containing ample accommodation for players, and seating 2,000 spectators. The bleachers accommodate 1,700. The playing field is unexcelled by any in Canada. Within the stadium is also a cinder track 15 feet wide with a straight-away of 100 yards, 20 yards wide. An additional rugby field will also be built outside the stadium to care for the overflow from the first and second team practices. Soccer is played on the campus in front of the Arts Building.

The Jock Harty Arena is equipped with an artificial ice-plant.

LIBRARIES.

The Douglas Library, named after the late Dr. James Douglas, whose initial gift of $150,000 made the building possible was built in 1924. It provides one large reading room, three smaller ones, a number of conference rooms, exhibition room and offices for the library and administrative staffs.

In the main reading room will be found a collection of some 5,000 volumes of general reference works on open shelves. The main collection, shelved on five tiers of book-stacks, occupies the centre of the building. The general library now includes about 125,000 volumes as well as many original manuscripts and prints.

The system of classification used is that of the Library of Congress.

750 journals and other serials are currently received.

The Lorne Pierce Collection of Canadian Literature is very rich in first editions, original manuscripts and rare Canadiana. It contains over 2700 items.

The Shortt-Haydon Collection of nearly 1700 portraits and views relating to Canada is one of the finest collections of its kind.

In addition to the general library there are departmental libraries for physics, chemistry, mining and metallurgy, geology and mineralogy, civil, mechanical, and electrical engineering.

ENGINEERING SOCIETY.

The representative student organization of the Faculty of Applied Science is the Engineering Society. All students registered in the Faculty of Applied Science are members of this society. Regular monthly meetings are held and the Society has been very fortunate, in recent years, in securing successful engineers to address the students during the session. Any student member who wishes to read a scientific paper before the society will always find the executive of the Engineering Society ready and willing to arrange a date. Prizes are offered in connection with such student papers.

The Society publishes an annual volume called the "Proceedings of the Engineering Society." This publication contains a record of the transactions of the Society and of its subsidiary organizations, chronological and alphabetical lists of the Science graduates and of many non-graduate Science alumni with their present positions and addresses, and other material of particular interest to Science alumni and students. The expense of the publication is met from the funds of the Society, from the sale of advertising, and from voluntary contributions from the Science alumni. Copies are supplied to the Science students and alumni.

The Society conducts a Technical Supplies Department, where all books prescribed, stationery, note books, drawing paper and instruments, and all other supplies, may be purchased at prices but slightly over cost. Any books not in stock will be ordered on payment of a small deposit.

EMPLOYMENT SERVICE

An Employment Service has been in successful operation at the University for several years. It is under the jurisdiction of the Service Control Committee of the Engineering Society and personally administered by the Secretary of the General Alumni Association. It is financed by the Engineering Society and the University. The objects of the Service are to assist the graduates in Engineering and other Faculties in securing suitable positions, and to help the students obtain work for their vacation periods. Communications should be addressed: Manager, Employment Service, Queen's University.

SCHOLARSHIPS IN SCIENCE

Awarded 1931.

First Year Scholarships.

The Sir Sandford Fleming Scholarship $70
Ian S. Panton, Bedford, England.

The Robert Bruce Scholarship ..... About $75
Charles R. Engler, Ottawa, Ontario.

The N. F. Dupuis Scholarship $60
Raymond H. L. Holmes, Kingston, Ontario.

Second Year Scholarships.

The P. D. Ross Scholarship, No. 1 .....$100
Geoffrey B. Thomas, Wallesley, Cheshire, England.

The P. D. Ross Scholarship, No. 2 .....$50
Patrick H. Taylor, Cobourg, Ontario.

Third Year Scholarships.

The Kenneth B. Carruthers, Scholarship in Third Year Mining and Metallurgy $137.50
Dominic M. Giachino, Cobalt, Ontario.

The Kenneth B. Carruthers Scholarship in Third Year Chemical and Metallurgical Engineering $137.50
R. Orville McGee, Ottawa, Ontario.

Prizes in Applied Science

The A. E. Segsworth Prize $50
Thomas D. Anderson, Auburn, Ontario.

The Engineering Institute of Canada Prize $25
Donald C. Stirling, St. Thomas, Ontario.

The L. M. Arkley Prize $50
Hugh G. Conn, New Lowell, Ontario.

The Perrault Prize $50
William A. H. Humphries, Strathroy. Ontario.

Medal

Governor-General's Medal,
Roland D. McDonald, Picton, Ontario.

DEGREES AWARDED IN THE FACULTY OF APPLIED SCIENCE, 1931

Master of Science

Name	Address
Beaton, N. S., B.Sc.	Haileybury, Ontario.
Horwood, H. C.	Kingston, Ontario.
Warren, S. P.	Golden, Colorado.

Bachelor of Science (Honours)

Campbell, J. S.	Toronto, Ontario.
McDonald, R. D.	Picton, Ontario.
McKerrow, G. C.	Frood Mine, Ontario.
McNeight, S. A.	St. Mary's, Ontario.
Reynolds, G. F.	Winnipeg, Manitoba.
Rice, H. R.	Niagara Falls, Ontario.
Smith, C. C.	Madoc, Ontario.
Taylor, H. F.	Blyth, Ontario.
Walker, W. D.	Galt, Ontario.
Williams, G. L.	Ottawa, Ontario.

Bachelor of Science

Adair, T. H.	Oshawa, Ontario.
Adams, G. W.	Toronto, Ontario.
Adams, H. R.	Ottawa, Ontario.
Baker, J. H., B.A.	Kingston, Ontario.
Bassermann, R. R.	Montreal, Quebec.
Bews, D. M.	Gananoque, Ontario.
Bowles, K. W. T.	Ottawa, Ontario.
Brine, R. J. F.	St. Mary's, Ontario.
Cairncross, A. T.	Long Branch, Ontario.
Carter, T. A.	Canfield, Ontario.
Cathcart, G. B.	Kingston, Ontario.
Colquhoun, J. A.	Morrisburg, Ontario.
Conn, H. G.	New Lowell, Ontario.
Coon, B. T.	Calgary, Alberta.
Cotton, C. H.	Ottawa, Ontario.
Daem, J. F.	Banff, Alta.
Ehmann, J. M.	Regina, Saskatchewan.
Elliot, G. F.	Winchester, Ontario.
Eynon, D. J.	Cornwall, Ont.

Name	Address
Farnham, G. S., B.A.	Ottawa, Ontario.
Farnsworth, D. A.	Cookshire, Quebec.
Fenwick, S. N.	St. Thomas, Ontario.
Goodman, J. E.	Montreal, Quebec.
Green, C. S.	Port Stanley, Ontario.
Greenwood, F. D., B.A.	New Liskeard, Ontario.
Greer, P. M.	Brockville, Ontario.
Haberman, J. A.	Regina, Saskatchewan.
Hastings, M. H.	Stanstead, Quebec.
Hosking, W. S.	Rockwood, Ontario.
Humphries, W. A. H.	Strathroy, Ontario.
Lockhart, W. W.	Ottawa, Ontario.
Merritt, H. H.	Hamilton, Ontario.
Mill, G. L.	Quebec, Quebec.
Miller, A. G.	Kingston, Ontario.
Minns, H. C.	Oshawa, Ontario.
MacEwen, S. B.	Fredonia, New York.
McVeigh, S. T.	Ottawa, Ontario.
Rabb, A. H.	Perth, Ontario.
Seright, R.	Calgary, Alberta.
Simmons, H. J.	Kingston, Ontario.
Smith, E. R.	Niagara Falls, Ontario.
Stevens, M. S.	Toronto, Ontario.
Stevenson, G. C.	Regina, Saskatchewan.
Sutton, W. R.	Peterboro, Ontario.
Thompson, E. P.	Parkhill, Ontario.
Turner, J. D.	Hamilton, Ontario.
Tuck, J. H.	Port Colborne, Ontario.
Waite, M. J.	Colborne, Ontario.
Weiss, H.	Silver Centre, Ontario.
Wilder, F. S.	Kingston, Ontario.
Wilson, G. E.	Kenmore, Ontario.
Zurbrigg, H. F.	Stratford, Ontario.

FACULTY OF APPLIED SCIENCE.
LIST OF STUDENTS
IN ATTENDANCE SESSION 1931-32
FIRST YEAR

Name	Address
Ahearn, W. J.	Ottawa, Ontario.
Alingovist, C. E.	Temiskaming. P.Q.
Aman, T. F. S.	Belleville, Ontario.
Ansley, F. C.	Toronto, Ontario.
Archer, D. B.	Calgary, Alberta.
Baker, R. L.	Sault Ste. Marie, Ont.
Barns, G. A.	Peterborough, Ontario.
Beckham, J. W.	Hatchley, Ontario.
Bellamy, K. L.	Niagara Falls, Ontario.
Bethune, W. A.	Hamilton, Ontario.
Biesenthal, C. G.	Pembroke, Ontario.
Billings, R. M.	Cayuga, Ontario.
Binch, R. H.	New Liskeard, Ontario.
Bradley. J. C.	Prescott, Ontario.
Bray, N. D.	Ottawa, Ontario.
Browne, E. I.	Ottawa, Ontario.
Burchill, L. S.	Uxbridge, Ontario.
Byrne, N. W.	Haileybury, Ontario.
Campbell, L. S.	Smith's Falls, Ontario.
Carufel, A. O.	Sault Ste. Marie, Ont.
Casey, F. L.	Ottawa, Ontario.
Connor, G. H. W.	Kingston, Ontario.
Cranston, F. W.	Arnprior, Ontario.
Culliford, S. H.	St. Catharines, Ont.
Cushing, W. F.	Thorold, Ontario.
Darling, A. G.	Kingston, Ontario.
Davidson, R. G.	Camborne, Ontario.
Destefano, N.	Copper Cliff, Ontario.
Dundass, W. M.	London, Ontario.
Earl. J. B.	Kingston, Ontario.
Earl, W. H.	Kingston, Ontario.
Easto, F. M.	Toronto, Ontario.
Ellsworth, A. C.	Ridgeway, Ontario.
Emery, C. L.	Chatham, Ontario.
Fleming, M. G.	Montreal, P.Q.
Fulton, H. F.	Chesterville. Ontario.
Furino, G.	Sturgeon Falls, Ont.

Name	Address
Garrow, G. C.	Ottawa, Ontario.
Gilbert, G. F.	Toronto, Ontario.
Hansford, E. B.	Sulphide, Ontario.
Harris, L. E.	Ottawa, Ontario.
Hartman, R. H.	Meaford, Ontario.
Hay, R. H.	Calgary, Alberta.
Healey, F. E.	Bellamy, Ontario.
Howie, R. E.	London, Ontario.
Hubbs. C. F	Midland, Ontario.
Hutchinson, D.	Norwich, Ontario.
Hutchinson, G. A	Ottawa, Ontario.
Isaac, V.	Markham, Ontario.
Isbister, M. D.	Sarnia, Ontario.
Jamieson, R. Y.	Prescott, Ontario.
Jeffery, R. H. C.	Toronto, Ontario.
Johnston, A	St. Thomas, Ontario.
Laidlaw, A. M.	Ottawa, Ontario.
Lazier, T. A.	Belleville, Ontario.
Lewis, R. W.	Mount Forest, Ontario.
Lightfoot, G. A.	Ottawa, Ontario.
Lobel, M.	Montreal, P.Q.
McCarey, J. N.	Ottawa, Ontario.
McClymont, N.	Walkerville, Ontario.
McDonald, H. J.	Dalhousie Sta., P.Q.
McGuire. N. M.	Cornwall, Ontario.
MacIlquham, J. O.	Ottawa, Ontario.
McInnes, H. J.	Barrie, Ontario.
McLachlan, H.	Victoria, B.C.
McRoberts, C. A.	North Bay, Ontario.
Mateer, J. D.	Fredericktown, Mo.
Mattson, H. B.	Kragerö, Norway.
Michaelson, G.	So. Porcupine, Ont.
Milne, J. N.	Haileybury, Ontario.
Monk, A. O.	Kingston, Ontario.
Mumford, R. D.	Glencoe, Ontario.
Murray, K. L.	Kingston, Ontario.
Myers, W. E.	Syracuse, N.Y.
Nesbitt, W. A.	Fort William, Ontario.
Newman, W. S.	Spencerville, Ontario.
Niemi, W. U.	Port Arthur, Ontario.

Name	Address
O'Brien, L.	Alexandria, Ontario.
Oille, N. H.	Sparta, Ontario.
Oille, V. A.	Toronto, Ontario.
Pequegnat, J. M.	Kitchener, Ontario.
Preston, W. W.	Hamilton, Ontario.
Ralston, K. M.	Noranda, P.Q.
Rattray, D. E	Toronto. Ontario.
Ratz, L. H.	Waterloo, Ontario.
Reid, T. M.	Listowel, Ontario.
Renzoni, L. S.	Espanda, Ontario.
Rigby, S.	Peterborough, Ont.
Robertson, H. A.	Cornwall, Ontario.
Robinson, C. T.	Three Rivers, P.Q.
Ross, J. H.	Orillia, Ontario.
Scott, C. J.	Sudbury, Ontario.
Scott. J. W.	Galt, Ontario.
Shattner, M. E.	Outremont, P.Q.
Sheppard, R. A.	Ottawa, Ontario.
Smedley, H.	Camden East, Ontario.
Smith, J. L.	Sarnia, Ontario.
Smith, L. M. A.	Montreal, P.Q.
Stark, R. G.	Ottawa, Ontario.
Sternberg, R. M.	Ottawa, Ontario.
Stoneman, E. G.	Ottawa, Ontario.
Stuart, N. A. J.	Estevan, Saskatchewan.
Taylor, W. E.	Brockville. Ontario.
Teague, D. F.	Niagara Falls, Ont.
Tewsley, H. H.	Peterborough, Ont.
Thompson, C. A.	Kingston, Ontario.
Thompson, J. G. C.	Prescott, Ontario.
Thompson, M. A.	Wellington, Ontario.
Trudel, J.	Sturgeon Falls, Ont.
Unsworth, W. T.	Sarnia, Ontario.
Vaillancourt, G.	Quebec, P.Q.
Ward, F. S.	Tilbury, Ontario.
Ward, W. G.	Peterborough, Ont.
Warnick, W. M.	Hamilton, Ontario.
Warren, G. T	Detroit, Michigan.
Way, T. H.	Ottawa, Ontario.
Weir, R. L.	Ottawa, Ontario.
Whyte, J. M.	Enniskillen, Ontario.

Name	Address
Wigle, G. P.	Dryden, Ontario.
Williams, S. C.	Ottawa, Ontario.
Willoughby, S.	Seeley's Bay, Ontario.
Wilson, A. B.	Port Arthur, Ontario.
Wilson, J. P.	Sudbury, Ontario.
Worden, H. D.	Ottawa, Ontario.

SECOND YEAR

Name	Address
Anderson, T. D.	Auburn, Ontario.
Arthey, G. C.	Ottawa, Ontario.
Barrie, A. O.	London, England.
Bews, K. F.	Kingston, Ontario.
Bonney, A. J. M.	Peterborough, Ontario.
Boyd, L. M.	London, Ontario.
Bradbury, J. L.	Aurora, Ontario.
Bright, W. J.	London, Ontario.
Brown, H.	Hamilton, Ontario.
Buell, M. A.	Kingston, Ontario.
Bulmer, W. L.	Renfrew, Ontario.
Burford, A. R.	Copper Cliff, Ontario.
Burke, N. A.	Ottawa, Ontario.
Clarke, R. E.	Gananoque, Ontario.
Craig, V. A.	Hamilton, Ontario.
DeMocko, G. G.	Fort William, Ontario.
Dunbar, E. F.	Guelph, Ontario.
Eby, J. O.	Paris, Ontario.
Eedson, T. M.	Hamilton, Ontario.
Ellard, E. R.	Ottawa, Ontario.
Elliott, H. A.	Vancouver, B.C.
Elliott, J. C.	Ottawa, Ontario.
Engler, C. R.	Ottawa, Ontario.
Evans, J. R.	Kingston, Ontario.
Ferguson, A. B.	Haileybury, Ontario.
Finnie, N. W.	St. Catharines, Ontario.
Fortin, J. J.	Charlevoix, Quebec.
Fraser, J. A.	Vankleek Hill, Ontario.
Fudge, A. H.	Hamilton, Ontario.

Name	Address
Garvie, H. L.	Owen Sound, Ontario.
Gauthier, C. E.	Ottawa, Ontario.
Gore, S. J.	North Bay, Ontario.
Graham, R. J.	Arnprior, Ontario.
Hart, J. R.	Kingston, Ontario.
Hayes, J. E.	Ottawa, Ontario.
Hendershott, E. W.	Hamilton, Ontario.
Hillier, C. H.	Sarnia, Ontario.
Holmes, R. H. L.	Kingston, Ontario.
Hosie, D.	Hamilton, Ontario.
Hubbard, W. D.	Hamilton, Ontario.
Jarvis, L.	Sudbury, Ontario.
Johnston, A. H.	Grafton, Ontario.
Kauth, C. G.	Gowanstown, Ontario.
Kidd, P. G. C.	Gananoque, Ontario.
King, R. B.	Rouleau, Saskatchewan.
Kirk, H. W.	Renfrew, Ontario.
Knowlton, W. C.	Leamington, Ontario.
Kostuik, J.	Cobalt, Ontario.
Langford, W. E.	Fort William, Ontario.
Leishman, M. A.	Sault Ste. Marie, Ontario.
Little, R. J.	St. Thomas, Ontario.
Lowe, W. R.	Sudbury, Ontario.
McAgy, J. A.	St. Thomas, Ontario.
McArthur, W. A.	Guelph, Ontario.
MacDiarmid, G. A.	Apple Hill, Ontario.
McIntosh, D. Y.	Beebe, P.Q.
McLaughlin, W. G.	Cumberland, Ontario.
MacRae, I. F.	Moose Jaw, Sask.
MacTaggart, D. E.	Aylmer, Ontario.
Mantle, H. A.	Grimsby, Ontario.
Marcellus, M. M.	Morewood, Ontario.
Marett, F. D.	Marmora, Ontario.
Megill, H. B.	Ottawa, Ontario.
Middlebro, H. M.	Owen Sound, Ontario.
Mitchell, K. W.	Calgary, Alberta.
Moore, F. E.	Simcoe, Ontario.
Moses, G. B.	Ottawa, Ontario.
Nesbitt, W. P.	Merritton, Ontario.
Nidd, M. E.	Ottawa, Ontario.
North, K. R.	Palmerston, Ontario.

Name	Address
Ostrander, J. C.	Welland, Ontario.
Panton, I. S.	Bedford, England.
Parker, C. H.	Kingston, Ontario.
Paterson, W. H.	Owen Sound, Ontario.
Pedersen, A. M.	Stratford, Ontario.
Perry, J. S. C.	Kingston, Ontario.
Pollock, A.	Kingston, Ontario.
Quinn, J. M.	Kingston, Ontario.
Racey, A. G.	Westmount, Quebec.
Ralph, H. T.	Stittsville, Ontario.
Rintoul, W. V.	Elmvale, Ontario.
Robertson, T. C.	Goderich, Ontario.
Rollins, J. B.	Tweed, Ontario.
Saunders, G. O.	Kingston, Ontario.
Sawle, R. T.	Welland, Ontario.
Scroggie, G. N.	Guelph, Ontario.
Shepherd, J. H.	North Bay, Ontario.
Singleton, J. M.	Winchester, Ontario.
Smith, A. E.	Guelph, Ontario.
Soles, W. E.	Rock Island, Quebec.
Southern, K. J.	Port Arthur, Ontario.
Stewart, J. A.	Renfrew, Ontario.
Stewart, L. G.	Burlington, Ontario.
Stroud, C. L.	Kingston, Ontario.
Sturgeon, W. E. L.	Hamilton, Ontario.
Thomas, L. M.	Hamilton, Ontario.
Thompson, G. H.	Brantford, Ontario.
Walker, H. E.	Hamilton, Ontario.
Whitmore, W. S.	Welland, Ontario.
Widdiefield, I. S.	Niagara Falls, Ontario
Wildblood, H. V.	Chatham, Ontario.
Williams, N. A.	Oshawa, Ontario.
Wilson, J. A.	Vankleek Hill, Ontario.
Wilson, M. H.	Salford, Ontario.
Wood, A. B.	Ellwood, Ontario.
Woolgar, C. E.	Hamilton, Ontario.
Wright, E. H.	Ottawa, Ontario.
Young, W. H.	Westboro, Ontario.

THIRD YEAR

Name	Address
Allan, H. F.	Kingston, Ontario.
Anglin, A. B.	Kingston, Ontario.
Austin, P. R.	Kingston, Ontario.
Bake, W. W.	Minden, Ontario.
Baker, E. G.	Ottawa, Ontario.
Ballantyne, K. H.	Smith's Falls, Ontario.
Battista, N. I.	Cornwall, Ontario.
Beale, C. F.	Athens, Ontario.
Benjafield, J. F.	St. Thomas, Ontario.
Bracken, J. M.	Gananoque, Ontario.
Browne, R.	Ottawa, Ontario.
Brown, R. C.	Ottawa, Ontario.
Bruce, R.	Brooklyn, P.E.I.
Bulmer, H. E.	Renfrew, Ontario.
Camelford, J. A.	Dunnville, Ontario.
Campbell, R. A.	St. Thomas, Ontario.
Capstick, E. H.	Orillia, Ontario.
Carson, R. B.	Ottawa, Ontario.
Chambers, R. J.	Regina, Saskatchewan.
Corbett, J. S.	St. Thomas, Ontario.
Cormie, J. M.	Norwood, Manitoba.
Cox, E.	Richmond, Ontario.
Croly, J. E.	Lambeth, Ontario.
Davis, B.	Timmins, Ontario.
Doherty, R. A.	North Bay, Ontario.
Dowsley, J. E.	Gananoque, Ont.
Durdan, F. S.	Niagara Falls, Ontario.
Evans, O. A.	Sault Ste. Marie, Ontario.
Ferguson, J. M. H.	Moncklands, Ontario.
Gates, J. J.	Cape Vincent, N.Y.
Gayton, A. E.	N. Attleboro, Mass.
Gerenraich, C. H.	St. Thomas, Ontario.
Gilbert, F. W.	Winnipeg, Manitoba.
Graham, T. V.	Kingston, Ontario.
Gray, J. N.	Ottawa, Ontario.
Grobb, F. S.	Brantford, Ontario.
Gussow, W. C.	Ottawa, Ontario.

Name	Address
Hall, C. E.	Toronto, Ontario.
Hall, J. K.	Rocksprings, Ontario.
Hallett, R. E.	Merritton, Ontario.
Hare, W. L.	Brittania Heights, Ontario.
Hart, R. C.	Meaford, Ontario.
Hartley, E. L.	Liverpool, England.
Hilliker, C. H.	Toronto, Ontario.
Honey, J. C.	Port Hope, Ontario.
Hosking, H. A.	Rockwood, Ontario.
Hurley, E. T.	Vankleek Hill, Ontario.
Innes, A. M.	Embro, Ontario.
Johnson, W. R. H.	Niagara Falls, Ontario.
Kilgour. R. J.	Ninga, Manitoba.
Klotz, C. Q. P.	Westboro, Ontario.
Lackey, W. J.	Toronto, Ontario.
Lithgow, R. A.	Thedford, Ontario.
Little, S. E.	Beachburg, Ontario.
McDiarmid, F. J.	Ottawa, Ontario.
McDougall, K. K.	Maxville, Ontario.
McKnight, C. E. V.	Ottawa, Ontario.
McMillan, A. D.	Burlington, Ontario.
McRoberts, C. E.	North Bay, Ontario.
Magnusson, E. O.	Winnipeg, Manitoba.
Myers, F.	Brandon, Manitoba.
Newman, W. C.	St. Catharines, Ontario.
Nicholson, R. M.	Parkhill, Ontario.
Parkes, S.	Dundas, Ontario.
Parsons, D. M.	Arnprior, Ontario.
Pilkey, G.	Myrtle Station, Ontario.
Platt, K. J.	Cobourg, Ontario.
Pugsley, A. E.	Toronto, Ontario.
Rorke, C. J. E.	Picton, Ontario.
Secord, C. L.	St. Thomas, Ontario.
Short, H. D.	Port Stanley, Ontario.
Silver, J. C.	Unity, Saskatchewan.
Simpkinson, T. V.	Grenfell, Saskatchewan.
Smith, D. A. G.	Westboro, Ontario.
Smith, H.	Bellaire, Mich.
Snyder, D. H.	Bridgeport, Ontario.

Name	Address
Spence, S. R.	Lakefield, Ontario.
Stafford, J. M.	Kingston, Ontario.
Stevenson, J. W.	Regina, Saskatchewan
Stewart, D. E.	Waba, Ontario.
Stewart, W. D.	Lennoxville, Quebec.
Stoddart, J.	Vancouver, B. C.
Stoneman, J. A.	Ottawa, Ontario.
Taylor, P. H.	Cobourg, Ontario.
Thomas, G. B.	Cheshire, England.
Thomas, J. F. J.	North Bay, Ontario.
Thompkins, R. W.	Hamilton, Ontario.
Thompson, E. J.	Hamilton, Ontario.
Tkachyk, J.	Ethelbert, Manitoba.
Travers, R. D.	Kingston, Ontario.
Tremblay, L.	Chicoutimi, Quebec.
Trowbridge, R.	Kingston, Ontario.
Waisberg. S.	Sturgeon Falls, Ontario.
Walter, J.	Regina, Saskatchewan.
Warren, F.	Galt, Ontario.
Watt, D. G.	Ottawa, Ontario.
Watts, T. O.	Kingston, Ontario.
Weegar, G. R.	Chesterville, Ontario.
White, F. L.	St. Marys, Ontario.
Wilson, A. A.	Coquitlam, B.C.
Wilson, G. W.	Oshawa, Ontario.
Wilson, O. C.	Ottawa, Ontario.
Wood, A. R.	Sault Ste. Marie, Ontario
Wright, A. L.	Ottawa, Ontario.
Wright, F. G.	Westport, Ontario.

FOURTH YEAR

Name	Address
Albulet, J.	Regina, Saskatchewan
Batzold, J. C.	St. Thomas, Ontario.
Beavan, A. P.	Nanaimo, B.C.
Benjafield, G.	St. Thomas, Ontario.
Bowker, C. E. J.	Thorold, Ontario.
Bray, R. H.	Ottawa, Ontario.
Bridger, J. R.	Kingston, Ontario .
Buckles, H.	Toronto, Ontario.

Name	Address
Carscallen, H. M.	Hamilton. Ontario.
Chalmers, J. B.	Owen Sound, Ontario.
Clapp, C. W.	Sandwich, Ontario.
Cowan, J. H.	Ottawa, Ontario.
Craig, J. G.	Hamilton, Ontario.
Crain, H. F.	Ottawa, Ontario.
Darling, W. S.	Brockville, Ontario.
Deline, H. G.	Napanee, Ontario.
Dobson, F. A.	St. Thomas, Ontario.
Dore, R. F.	Ottawa, Ontario.
Dove, A. B.	Hamilton, Ontario.
Gilbert, W. D.	Gananoque, Ontario.
Harshaw, M. W.	Burlington, Ontario.
Hawkes, J. M.	Oshawa, Ontario.
Heintzman, G. H.	Arnprior, Ontario.
James, F. E.	London, Ontario.
Langman, J. N.	Aurora, Ontario.
Lawson, F. C.	Sudbury, Ontario.
Little, H. W.	Teeswater, Ontario.
MacCaul, D. H.	Sault Ste. Marie, Ont.
McCubbin, J. W.	North Bay, Ontario.
McGee, R. O.	Ottawa, Ontario.
McIntosh, P.	Vankleek Hill, Ontario.
McKechnie, N. D.	New Westminster, B.C.
McKelvey, R. G.	Kingston, Ontario.
MacKinnon, M. J.	Vankleek Hill, Ontario.
MacLachlan, J. R.	Ottawa, Ontario.
MacLean, D. M.	New Glasgow, Nova Scotia.
MacMillan, J. S.	Vankleek Hill, Ontario.
Marion, L. E.	Calabogie, Ontario.
Megill, W. J.	Ottawa, Ontario.
Pollock, H. S.	Ormstown, Quebec.
Reid, J. M.	Kingston, Ontario.
Richards, V. L.	St. Thomas, Ontario.
Roach, A. G.	Sudbury, Ontario.
Ross, D. P.	Kingston, Ontario.
Roy, L. J.	Toronto, Ontario.
Rozovsky, H.	Saint John, N.B.

Name	Address
Shannon, G. C.	Prescott, Ontario.
Simmons, D. S.	Sarnia, Ontario.
Stewart, G. A.	Ottawa, Ontario.
Stewart, S. B.	Rock Island, Quebec.
Stidwell, J. B. M.	Cornwall, Ontario.
Stirling, D. C.	St. Thomas, Ontario.
Thomas, C. E.	Hamilton, Ontario.
Turner, A. J.	Hamilton, Ontario.
Walli, E. J.	Sudbury, Ontario.
Way, E. G. O.	Ottawa, Ontario.
Williams, J. E.	St. Johns, N.B.
Williams, L. C.	Ottawa, Ontario.
Yule, C.	Hagersville, Ontario.
Doyle, J. E.	Frankford, Ontario.
McVeigh, S.	Ottawa, Ontario.
Williams, G. L.	Ottawa, Ontario.

M.Sc. WORK

Baker, J. H.	Kingston, Ontario.
Brine, R. J.	St. Mary's, Ontario.
Brock, B. B.	Vancouver, B.C.
Burke, D. K.	Edmonton, Alberta.
Campbell. J. S.	Toronto, Ontario.
Farnham, G. S.	Ottawa, Ontario.
Franklin, G. A.	Vankleek Hill, Ontario.
Harcourt, G. A.	Edmonton, Alberta.
Jack, D.	Hamilton, Ontario.
Lang, A. T.	Winnipeg, Manitoba.
McDonald, R. D.	Picton, Ontario.
McNeight, S. A.	St. Mary's, Ontario.
Prince, R. J.	St. Mary's, Ontario.
Plewes, A. C.	Brockville, Ontario.
Sutton, W. R.	Peterborough, Ontario.
Turner, J. D.	Hamilton, Ontario.
Wilder, F. S.	Kingston, Ontario.
Zurbrigg, H. F.	Stratford, Ontario.

FIRST YEAR—ALL COURSES

	VIII.	IX.	X.	XI.	I.	II.	III.	IV.
Mon.	English Sects. 1-2, Phys. II. Lab. Sect. 5 Surv. I Sects. 7-8	Chem. I Sects. 1-4 Phys. II. Lab. Sect. 5 Surv. I Sects. 7-8	Math. IV. Sects. 1-4 Phys. II. Lab. Sect. 6 Draw. I. Sects. 7-8	Phys. I. Sects. 1-4 Phys. II. Lab. Sect. 6 Draw. I. Sects. 7-8	Eng. I. Sects. 5-6 Phys. II. Lab. Sect. 1 Surv. I. Sects. 3-4	Chem. I. Sects. 5-8 Phys. II. Lab. Sect. 1. Surv. I. Sects. 3-4	Math. IV. Sects. 5-8 Phys. II. Lab. Sect. 2 Projection Sects. 3-4	Phys. I. Sects. 5-8 Phys. II. Lab. Sect. 2 Projection Sects. 3-4
Tues.		Math. I. Sects. 5-8 Draw. I. Sects. 1-4	English I. Sects. 7-8 Draw. I. Sects. 1-4	Math. II. Sects. 5-8 Draw. I. Sects. 1-4	Math. II. Sects. 3-4 Chem. I. Sects. 5-8	Math. I. Sects. 1-4 Chem. I. Sects. 5-8	Math. II. Sects. 1-2 Chem. I. Sects. 5-8 English I. Sects. 3-4	
Wed.	English I. Sects. 1-2	Chem. I. Sects. 1-4 Draw. I. Sects. 5-8	Math. III. Sects. 1-4 Draw. I. Sects. 5-8	Phys. II. Sects. 1-4 Draw. I Sects. 5-8	English I. Sects. 5-6 Chem. I. Sects. 1-4	Chem. I. Sects. 5-8 Chem. I. Sects. 1-4	Math. III. Sects. 5-8 Chem. I. Sects. 1-4	Phys. II. Sects. 5-8
Thurs.	Phys. II. Lab. Sect. 3 Draw. I. Sects. 1-2	Math. I. Sects. 5-8 Phys. II. Lab. Sect. 3 Draw. I. Sects. 1-2	English I. Sects. 7-8 Phys. II. Lab. Sect. 4 Projection Sects. 1-2	Math. II. Sects. 5-8 Phys. II. Lab. Sect. 4 Projection Sects. 1-2	Math. II. Sects. 3-4 Phys. II. Lab. Sect. 7 Draw. I. Sects. 5-6	Math. I. Sects. 1-4 Phys. II. Lab. Sect. 7 Draw. I. Sects. 5-6	Math. II. Sects. 1-2 Phys. II. Lab. Sect. 8 Projection Sects. 5-6 English I. Sects. 3-4	Phys. II. Lab. Sect. 8 Projection Sects. 5-6
Fri.	Surv. I. Sects. 5-6	Chem. I. Sects 1-4 Surv. I. Sects. 5-6 Projection Sects. 7-8	Math. IV. Sects. 1-4 Projection Sects. 7-8	Phys. II. Sects. 1-4 Chem. I. Sects. 5-8	Surv. I. Sects. 1-2 Draw. I. Sects. 3-4	Phys. II. Sects. 5-8 Surv. I. Sects. 1-2 Draw. I. Sects. 3-4	Math. IV. Sects. 5-8	Engineering Society
Sat.	Phys. I. Sects. 5-8	Phys. I. Sects. 1-4 Math. III. Sects. 5-8	Math. III. Sects. 1-4					

SECOND YEAR

	VIII.	IX.	X.	XI.	I.	II.	III.	IV.
Mon.		**Phys. III.**	**Genl. I.**	Math. V.	Phys. IV. (a) A.B.C.D. (Sect.1) Min. I. A.B.C.D. (Sect.2) Descr. Geom. (a) E. F. G. Phys. IV. (b) E.F.G. (Sects.1,2) Draw. III. (b) E.F.G. (Sects.3,4)	Phys. IV. (a) A.B.C.D. (Sect.1) Min. I. A.B.C.D. (Sect.2) Deser. Geom. (a) E. F. G. Phys. IV. (b) E.F.G. (Sects.1,2) Draw. III. (b) E.F.G. (Sects.3,4)	Phys. IV. (a) A.B.C.D. (Sect.2) Min. I. A.B.C.D. (Sect.1) Phys. IV. (b) E.F.G. (Sects.3,4)	Phys. IV. (a) A.B.C.D. (Sect.2) Min. I. A.B.C.D. (Sect.1) Phys. IV. (b) E.F.G. (Sects.3,4)
Tues.	Qual.Chem. II.(a) A.B.C.D	**Geol. I. A.B.C.D.** Genl. Chem. II. E.F.G.	Min. I. A.B.C.D. Astron II. E.F.G.	Phys. IV (a) A.B.C.D. Qual.Chem. II.(b) A.B.C.D. **Surv. II.** E.F.G.	Phys. III. A.B.C.D. (Sect.1) Shop Work E.F.G. (Sect. 1) Surv. II. E.F.G. (Sects.3,4)	Phys. III. A.B.C.D. (Sect.1) Shop Work E.F.G. (Sect. 1) Surv. II. E.F.G. (Sects.3,4)	Phys. III. A.B.C.D. (Sect.2) Shop Work E.F.G. (Sect. 2) Surv. II. E.F.G. (Sects.3,4)	Phys. III. A.B.C.D. (Sect.2) Shop Work E.F.G. (Sect. 2)
Wed.	Surv. III. A.B.C.D.(Sect. 2)	Surv. III. A.B.C.D. (Sect. 2) Phys. IV E.F.G.	Surv. III. A.B.C.D. (Sect. 2) **Mech. IX.** E.F.G.	Math. V.	Qual. Chem. II. A.B.C.D. Shop Work E.F.G. (Sect. 3) Surv. II. E.F.G. (Sects.1,2)	Qual. Chem. II. A.B.C.D. Shop Work E.F.G. (Sect. 3) Surv. II. E.F.G. (Sects.1,2)	Descr. Geom. (a) Draw. II. (b) A.B.C.D. Shop Work E.F.G. (Sect 4) Surv. II. E.F.G. (Sects.1,2)	Descr. Geom. (a) Draw. II. (b) A.B.C.D. Shop Work E.F.G. (Sect. 4)
Thurs.		**Geol. I. A.B.C.D.** Draw. III (b) E.F.G. Descr. Geom. (a) E.F.G.	**Surv. III. A.B.C.D.** Draw III. (b) E.F.G. Descr. Geom. (a) E.F.G.	Qual. Chem. II. **A.B.C.D.** Draw III. (b) E. F. G. Descr. Geom. (a) E.F.G.	Surv. III. A.B.C.D. (Sect.1) Mech. IX. E.F.G. (Sect. 1)	Surv. III. A.B.C.D. (Sect.1) Mech. IX. E.F.G. (Sect. 1)	Surv. III. A.B.C.D. (Sect.1) Draw. III. (a) E.F.G.	Draw. III. (a) E.F.G.
Fri.		**Phys. III.**	Genl. I.	Math. V.	Qual. Chem. II. A.B.C.D. Phys. III. E.F.G. (Sects.1,2) Mech. IX. E.F.G. (Sect. 2)	Qual. Chem. II. A.B.C.D. Phys. III. E.F.G. (Sects.1,2) Mech. IX. E.F.G. (Sect. 2)	Qual. Chem. II. A.B.C.D. Phys. III. E.F.G. (Sect. 2)	Qual. Chem. II. A.B.C.D. Phys. III. E.F.G. (Sect. 2) Engineering Society
Sat.		Descr. Geom. (a) Draw. II (b) **A.B.C.D.** Genl. Chem. II. E.F.G	Descr. Geom. (a) Draw. II (b) **A.B.C.D.**	Descr. Geom. (a) Draw. II (b) A.B.C.D.				

(a)—First term. (b)—Second term.

	VIII.	IX.	X.	XI.	I.	II.	III.	IV.
Mon.	Elect. I. (a) A.D.E. Elect. IV. (a) F Math. VIII H (a)	Quant. Chem. II. **B.** Geol. II. **C.** Org. Chem. I.(a) Dc. Ry. I. (a) E **Mun. I. (b)** E Elect. III. G.	Thermo. I. (a) A.D.E.F.G. Genl. Chem. II. B Min. II. (b) C Elect. I. (b) A.D.E. Elect. IV. (b) F Phys. V. (b) G. H.	Met. II A.B.C.Dm. Org. Chem. I.(a) Dc. Mech. II. (b) **F.G.** Math. IX. (b) **H.**	Genl. III. A.E.G. Sect. 1 Ind. Chem. II **B.** Geol. Reps. C. Elect. I. D. Elect. IV. F.	Genl. III A.E.G. Sect. 1 Ind. Chem. II B. Geol. Reps. C. Elect. I. D. Elect. IV. F.	Genl. III. D.F. Sect. 2 Ind. Chem. II **B.** Geol. Reps. C. Elect. I. A.E.	Gen. III. D.F. Sect. 2 Elect. I. **A.E.**
Tues.	German A. B.H. Hydraulics I E.F.G.	**Mining I.** **A.** Phys. Chem. I. **B.C.D.** Hydraulics I E.F.G.	Surv. V. (a) A.C. Geol. III. (b) **A.C.** Ind. Chem. II. **B.D.** Met. I. E.F.G. Phy.VI(a)VII(b) H.	**Mech. I.** D. (a) F. G. Chem. Eng. I. (b) Dc.	Min. III. (a) C Geol. III. A.C. (b) Phys. Chem. I. B (b) C. Dm. (a) Dc. Sect. 1. Ind. Chem. II. Dc. Sect. 2 Fire Assay Dm. (b) Quant. Chem. II. B. (a) Survey IV. E. Thermo. V. F. **Elect. III.** **G.** Phy.VI(a)VII(b) H.	Min. III. (a) C Geol. III. A.C. (b) Phys. Chem. I. B (b) C. Dm. (a) Dc. Sect. 1. Ind. Chem. II. Dc. Sect. 2 Fire Assay Dm. (b) Quant. Chem. II. B. (a) Survey IV. E. Thermo. V. F. **Elect. III.** **G.** Phy.VI(a)VII(b) H.	Geol. III. A.C. (b) Phys. Chem. I. B (b) C. Dm. (a) Dc. Sect. 1. Ind. Chem. II. Dc. Sect. 2 Fire Assay Dm. (b) Quant. Chem. II. B. (a) Surv. IV. E. Elect. III. **G.** Phy.VI(a)VII(b) H.	Fire Assay Dm.(b)
Wed.	Mech. I. D (a) F.G. Ore Dressing **(b)** **A.C.Dm.** Genl. VI **E.** Math. VIII. H. (a)	Genl. V. A.D.F.G. Quant. Chem. II. **B.** Geol. II. C. Surv. IV. E.	Met. II A.B.C.Dm. Genl. II. **E.** Math. VI. (a) F.G. Math. VII. G **(b)** Phys. VIII. H **(b)**	Mining I. A. Min. V. **or VI.** C. Org. Chem. I. B.Dc. Geol. IX **E.** Mech. IV F. (a) Elect. IV. F (b) **Elect. III.** **G.** Math. IX. (b) H.	Min. IV **A.C.** Bateriol XII. B. (b) Mech. III. D.(a)F. Org. Chem. I (b) Dc. Phys. Chem. I B (a) Dm. (b) Ry. I. **E.** Phys. V. G.H.	Min. IV A.C. Bateriol XII. B. (b) **Mech. III.** D.(a) F. Org. Chem. I.(b) Dc. Phys. Chem. I **B** (a) Dm. (b) Ry. I. **E.** Phys. V. G.H.	Min. IV. **A.C.** Bateriol XII. B. (b) **Mech. III.** D.(a) F. Org. Chem. I.(b) Dc. Phys. Chem. I B (a) Dm. (b) Ry. I. **E.** Phys. V. G.H.	Org. Chem. I (b) Dc.

(a)—First term. (b)—Second term.

	VIII.	IX.	X.	XI.	I.	II.	III.	IV.
Thurs.	German A. **B.H.**	Phys. Chem. I. **B.C.D.** Ry. I. E. Mech. IV. F. Phys. V. (a) G. H.	**Min. III (a)** **A.C.** Ind. Chem. II. **B.D.** Genl. II. E. Elect. III. G. Phy. VI(a) VII(b) H.	Ore Dressing A.C.Dm. Genl. Chem. II B. Chem. Eng. I. Dc. (b) Geol. IX. E. Elect. II. G.H.	Quant. Chem. I. **A.C.D.H.** Struct. I. E. **Mech. III.** **F.** **Mech. VII.** **G.**	Genl. V. A.D. Quant. Chem. I. C.H. Quant. Chem. II. B Struct. I. **E.** **Mech. III.** **F.** **Mech. VII.** **G.**	Genl. V. A.D. Quant. Chem. I. C.H. Quant. Chem. II. B Struct. I. **E.** **Mech. III.** **F.** **Mech. VII.** **G.** Phy. VIII. (b) H.	Quant. Chem. I. C.H. Quant. Chem. II. B. Phys. VIII. (b) H.
Fri.	Min III. (a) A.C. Min. V. or VI. C (b) Quant. Chem. I. Dc. (b) Math. VIII. H. (a)	Thermo I. (a) A.D.E.F.G. Mun. I. (b) E. Thermo II (b) F.G. **Geol. II.** **C.** Quant. Chem. I. Dc. (b) Phys. XIV. **B. (a)**	Elect. I. A.D.E. Min. II. (b) C. Thermo. V. F (b) Phys. XIV. **B. (a)** Math. VI. (a) F.G. **Math. VII.** **G. (b)** **Phys. VIII.** **H. (b)**	Org. Chem. I. B. Dc. Geol. III. (b) A.C Min. V. or VI. C. (a) Met. III. (b) Dm. Struct, I. E. Elect. IV. F (a) Mech. II. (b) F.G. Math. IX. (b) **H.**	Quant. Chem. I A.D. Quant. Chem. II. B Min. III. (a) C Genl. VI. E.	Quant. Chem. I A.D. Quant. Chem. II. **B.** Min. III. (a) C Geol. and C. Genl. VI. E. Genl. V. F.G.	Quant. Chem. I A.D. Quant. Chem. II. **B.** Min. Reps. C. Genl. VI. E. Genl. V. F.G.	Engineering Society
Sat.	Fire Assay (b) A Shop Work F (a) German **A.** **B.H.**	Fire Assay (b) A. Org. Chem. I **B.** **Surv. V. (a)** **A.C.** Ind. Chem. II. Dm. Dc. Sect. 1 Phys. Chem. I. Dc. Sect. 2 Shop Work **F** Elect. II. G.H.	Fire Assay (b) A. Org. Chem. I **B.** **Surv. V. (a)** A.C. Ind. Chem. II. Dm. Dc. Sect. 1 Phys. Chem. I. Dc. Sect. 2 Shop Work **F.** **Elect. II.** **G.H.**	Fire Assay (b) A Org. Chem. I **B** **Surv. V. (a)** **A.C.** Ind. Chem. II. Dm. Dc. Sect. 1 Phys. Chem. I. Dc. Sect. 2 Thermo. V. F (a) **Shop Work** F. (b) **Elect. II.** **G.H.**				

(a)—First term. (b)—Second term.

	VIII.	IX.	X.	XI	I.	II.	III.	IV.
Mon.	Mining II. A. German 2 (a) B.H. **Thermo. III.** Dc. F.G.	**Econ. I.** A.B.C.D. E.F.G.H.	**Geol. VIII.** **A.C.** Phys. Chem. II. **B.D.** Highway (a) E. Mun. II. (b) E. Mech. IX. (a) F. Phys. XI. H. (b)	Geophys. Prosp. A.C. Ind. Chem. III. B. (a) Genl.Chem.III(b) B. **Met. II.** Dc. Metallography Dm. Mun. III. **E.** Hydraulics II **F.** Elect V. G. Math. X (b) H. Math. XI. (a) H.	**Mining III.** **A.** Ind. Chem. III. B. (a) Coll. Chem. I. B. (b) Mining IV C. Dm. Chem. Eng. III. Dc. Struct. II (a). E. **Mech. V.** **F.** Elect. X G. **Phys. XIII.** **H.**	**Mining III.** **A.** Ind. Chem. III. B. (a) Coll. Chem. I. B. (b) Geol. VII. **C.** Chem. Eng. III. **Dc.** Struct. II. E. **Mech. V.** **F.** Elect. X G. **Phys. XIII.** **H.**	**Mining III.** **A.** Ind. Chem. III. **B. (a)** **Coll. Chem. I.** B. (b) Geol. VII. **C.** Chem. Eng. III. **Dc.** Struct. II. E. **Mech. V.** **F.** Elect. X G. **Phys. XIII.** **H.**	Chem. Eng. III. **Dc.**
Tues.	Phys. Chem. II. B.D. German A. C.	**Met. IV.** **A.Dm.** Chem. Reps. **B.** Geol. VI. **C.** Struct. IV E. Mech. XI. (b) F. Phys. IX. H. (a) Elect. VIII G.H.	Mech. IV. (a) **A.D.E.** Hydr. I. (b) A.D. Phys. Chem. III. **B.** Biol. (a) C. Struct. II. (b) E. **Mech. V.** **F.** Elect. X. **G.**	Geol. VIII A.C. Org. Chem. II. **B.** Met. V (a) Dm. Ry. II. E. Thermo. III. Dc. F.G. Phys XII. H. (a) Phys. X. H. (b)	Mining II. A **Chem. Opt.** **B.** Geol. Thes. **C.** **Struct. III.** **Dc.** Met. VII. Dm. Ry. II. **E.** Mech V. **F.** Elect. VIII. G.H.	**Chem. Opt.** **B.** Geol. Thes. **C.** **Struct. III.** Dc. Met. VII. Dm. Ry. II. **E.** Mech V. **F.** Elect. VIII. G.H.	**Chem. Opt.** **B.** Geol. Thes. **C.** Chem. Eng. III. Dc. (a) Ry. II. **E.** Mech. V. **F.** Elect. VIII. G.H.	

(a)—First term. (b)—Second term.

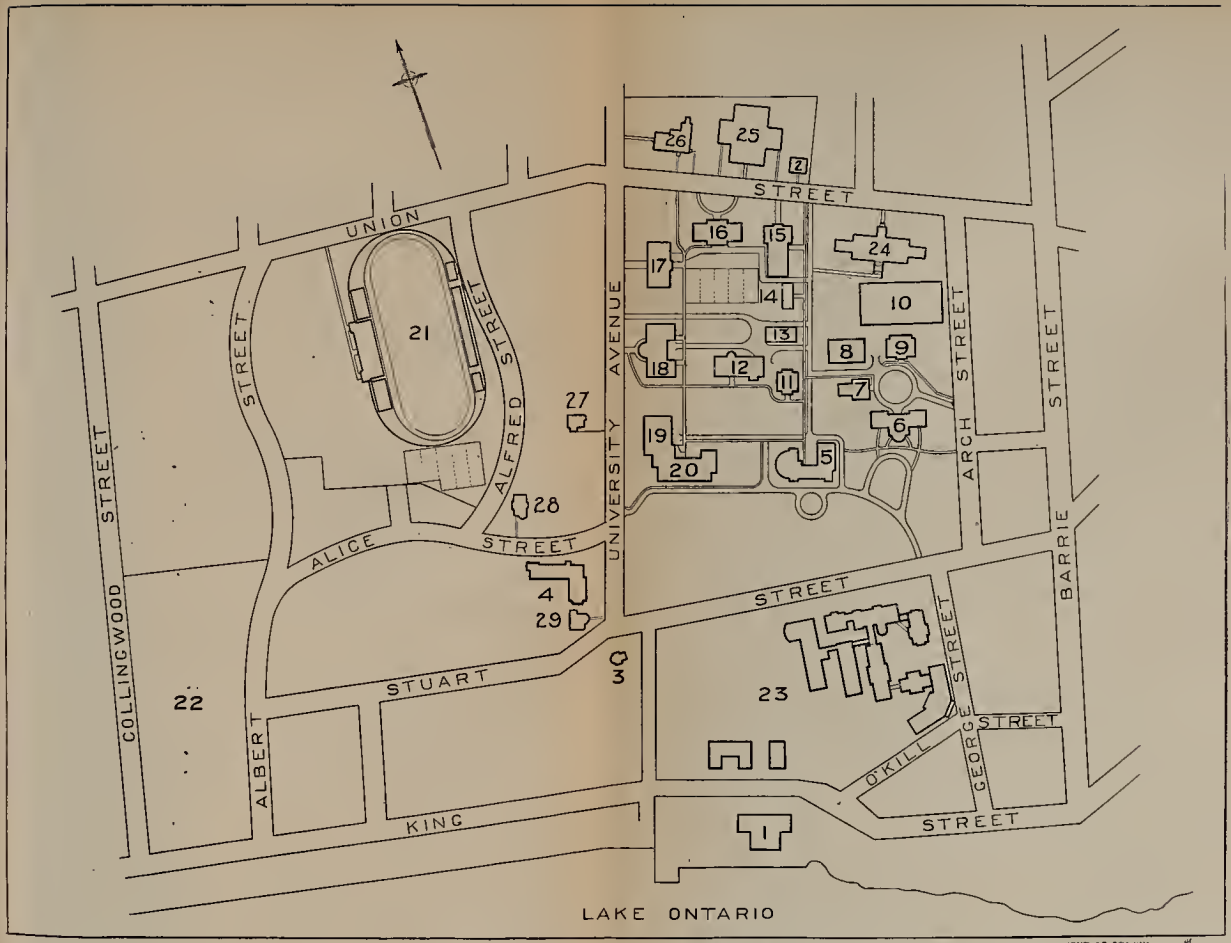
	VIII	IX	X.	XI.	I	II	III	IV
Wed.	Mining II. A. (a) Mining IV. (a) C.Dm. Met VI. (b) Dm. G. Ore Dressing (b) Dc. German 2 (a) B.H.	**Econ. I.** A.B.C.D. E.F.G.H.	Mining II. A Ind. Chem. I. E.F. **Met. II.** Dc. Elect. XII G.H. Phys. XI. H. (b)	**Met. IV.** A.Dm. Chem. Reps B. **Min. V. or VI.** C. Chem. Eng. II. **Dc.** Highway (a) E. Mun. II. (b) E. Mech. V. **F.** Elect. V. **G.** Math. X. (b) H Math. XI. (a) H.	**Mining III.** **A.** Org. Chem. II. B. (a) Genl. Chem. III. B. (b) Geol. Thes. **C.** Chem. Eng. II. **Dc.** Phys. Chem. II. Dm. **Struct. IV.** **E.** Elect. VII. F. Thermo. III. (a) G. **Phys. XIII.** **H.**	**Mining III.** **A.** Org. Chem. II. B. (a) Genl. Chem. III. B. (b) Geol. V. (b) **C.** Chem. Eng. II. **Dc.** Phys. Chem. II. Dm. **Struct. IV.** **E.** Elect. VII. F. Thermo. III. (a) G. **Phys. XIII.** **H.**	**Mining III.** **A.** Org. Chem. II. B. (a) Genl. Chem. III B. (b) Geol. Thes. **C.** Chem. Eng. II. **Dc.** Phys. Chem. II. Dm. Struct. IV. **E.** Elect. VII. **F.** Thermo. III. (a) G. **Phys. XIII.** **H.**	
Thurs.	Hydr. I. A.D. German A. **C.**	**Mech. IV.** A.D.E. Geol. VI. C. Hydr. II. **F.** Elect. XII. G.H.	Hydr. I. (a) A.D. Geol. VIII. (b) A.C. **Biol. II.** **C. (a)** Phys. Chem. III. **B.** Chem. Eng. III. Dc. (b) Met. V. (b) Dm. Eng. Econ. **E.** Mech. VI. **F.** **Elect. V.** **G.** Phys. IX. H (a)	**Met. IV.** A.Dm. Org. Chem. II. B. Ore Dressing **Dc.** Struct. II. E. Mech. V. **F.** Phys. XII. H. (a) Phys. X. H. (b)	Phys. Chem. II. B. Dc. Geol. Thes. **C.** **Met. Lab. II.** **Dm.** Highway E. (a) Mun. II. III. E. (b) **Elect V.** G.	Phys. Chem. II. B. Dc. Geol. V. (b) A.C. **Met. Lab. II.** **Dm.** Highway E. (a) Mun. II. III. E. (b) **Elect V.** G.	Phys. Chem. II. B. Dc. Geol. Thes. **C.** Met. Lab. II. Dm. Highway E. (a) Mun. II. III. E. (b) **Elect V.** G.	

(a)—First term. (b)—Second term.

FOURTH YEAR

	VIII	IX	X.	XI	I	II	III	IV
Fri.	**Milling** **A.Dm.** **Chem. Opt.** **B (b)** German 2 (a) B.H. Min. V. or VI. C. (b) **Hydraulics II** E. G. Met. VIII. (a) F.	**Milling** **A.Dm.** **Chem. Opt.** **B. (b)** Chem. Eng. III. **Dc.** Hydr. II. E.G. Met. VIII. (a) F Mech. XI. (b) F.	**Milling** **A.Dm.** **Chem. Opt.** **B. (b)** Chem. Eng. III. **Dc.** **Struct. IV.** **E.** **Thermo. IV.** **F.** Phys. XI. (b) H.	**Milling** **A.Dm.** Ind. Chem. III. B. (a) Genl.Chem.III(b) B. Min. V. or VI. C. (a) Chem. Eng. II **Dc.** Struct. IV. E. Thermo. IV. F. Elect. V. G. Math. X. (b) H. Math. XI. (a) H.	**Milling** **A.Dm.** Org. Chem. II. B. (b) Phys.Chem.III(a) B. Geol. Thes. **C.** Shop work (b) Dc. **Struct. II.** E. **Thermo. IV.** **F.** Elect V. **G.** **Phys. XIII.** **H.**	**Milling** **A.Dm.** Org. Chem. II. B. (b) Phys.Chem.III(a) B. Geol. Thes. C Shop work (b) Dc. **Struct. II.** E. **Thermo. IV.** **F.** Elect V. **G.** **Phys. XIII.** **H.**	**Milling** **A.Dm.** Org. Chem. II. B. (b) Phys.Chem.III(a) B. Geol. Thes. C. Shop work (b) Dc. **Struct. II.** E. **Thermo IV.** **F.** Elect V. **G.** **Phys. XIII.** **H.**	Engineering Society
Sat.	German A. C. Fire Assay, (b) C.	**Milling** **A.** Org. Chem. II. **B.** Fire Assay, (b) C. Metallography Dm. Hydr. III. E (b), G (a) Thermo. III (a) Dc.F. Mech. VIII. (b) F. Phys. IX. (a) H. Elect. XII. (b) G. H.	**Milling** **A.** Org. Chem. II. B. Fire Assay, (b) C. Metallography **Dm.** Genl. IV. (a) E. Hydr. III. E (b), G (a) Thermo. III (a) Dc.F. Mech. VIII. (b) F. Elect. XII. (b) G. H.	**Milling** A. Org. Chem. II. B. Fire Assay, (b) C. Metallography Dm. Genl. IV. (a) E. Thermo. III (a) Dc.F. Mech. VIII. (b) F. Elect. XII. (b) G. H. Phys. XII. (a) H.				

(a)—First term. (b)—Second term.



BUILDINGS OF QUEEN'S UNIVERSITY

PLAN OF QUEEN'S UNIVERSITY GROUNDS

1. Central Heating Plant.
2. Commerce Building
3. Observatory
4. Ban Righ Hall
5. Old Arts Building
6. Principal's Residence
7. Old Medical Building
8. Hydraulics Laboratory
9. Pathological Laboratory
10. Jock Harty Arena
11. Carruther's Hall
12. Fleming Hall
13. Storehouse
14. Mechanical Laboratory
15. Nicol Hall
16. Gordon Hall
17. Douglas Library
18. Ontario Hall
19. Grant Hall
20. Kingston Hall
21. Richardson Stadium
22. Leonard Field
23. Kingston General Hospital and Richardson Laboratory.
24. Miller Hall
25. Gymnasium
26. Students' Memorial Union
27. Gordon House
28. Goodwin House
29. Macdonnell House

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